COAL AGE

Vol. 1 NEW YORK, JUNE 8, 1912 No. 35

LAST week we had a few words to say concerning the desirability of scientific management as compared with rule-of-thumb methods. Continuing along the same line, we do not wish anyone to infer that we believe any single panacea exists for all labor troubles. Lazy, inefficient, selfish and cruel people will always be with us, and as a result we cannot hope to eliminate all poverty and unhappiness.

Scientific management consists in a combination of four great principles: *First*, the development of a true science, or, in other words, the substitution of a science for the individual judgment of the workman; *second*, the scientific selection of the workman; *third*, his scientific education and development; *fourth*, intimate friendly co-operation between management and men.

The problem of any management is to obtain the best initiative of every workman, and to accomplish this end, the company must give some *special incentive* to its men. The inducements generally offered are higher wages, hope of promotion, shorter hours and better surroundings. Under the most modern type of "task" management, personal initiative (hard work and good-will) is obtained by developing a science for each element of a man's work, by teaching, co-operating and sharing responsibility.

In order to perfect a system of scientific management, a company must spend some money in studying the various kinds of work. For instance, careful research has shown that a first-class laborer can be under load only 42 per cent. of the time and should be free from load 58 per cent. of the day. When carrying a heavy weight, the muscle tissues are in process of degeneration, and frequent periods of rest are required for the blood to restore these tissues.

The average manager would question whether there is any science in the work of shoveling coal, but a little thought and analysis will prove that definite laws can be formulated for this type of simple labor. There is a given shovel-load at which a man will do his biggest day's work. One investigator discovered that a first-class man will shovel a larger tonnage per day with a 21 lb. load than with a greater or less load on his shovel. It is evident that the load will vary three or four pounds, but highest efficiency is obtained when the size of shovel used accommodates an average of about 21 lb. of the material being handled.

One company after making a careful and extended investigation of this simple problem of shoveling, and after a study of all motions and the elimination of each unnecessary movement on the part of the men, selected less than 200 competent laborers, who regularly did the work formerly accomplished by 500 men working on their own responsibility with varied tools of their own selection. The fewer number of men received higher individual wages than when they worked under the old rule-of-thumb system.

It must be understood that a plan of scientific management can only be effected by selecting and commencing with one likely individual; other laborers are experimented with later and taught to perform their tasks according to definite rules, which eliminate every unnecessary motion and intelligently recognize the laws of human endurance. When workmen are herded into large gangs, instead of being treated as separate individuals, a loss of ambition and initiative is sure to result, and individual efficiency falls below the level of the worst man in the gang.

When scientific study was applied to bricklaying, the new methods raised the speed of work from 120 to 350 bricks per man per hour. The idea on the part of some union men that restriction of output is a benefit to the trade is erroneous. It should be plain to all that deliberate loafing inevitably results in making every laborer pay higher rent, and in addition drives trade away from the locality where the restrictive measures are in force. The high percentage of unemployed in England is due largely to the action of British workmen in deliberately restricting their output.

The average man will go slowly if, instead of being given a task, he is told to do as much as he can. No workman has authority to make other men co-operate with him to do work faster. It is only through *enforced* standardization of methods, *enforced* adoption of the best implements, and *enforced* co-operation, that higher efficiency can be secured. From two to four years should be consumed in making the change to scientific management, and in coal mining, the added prosperity that would result to operator and miner would be tremendous.

The Roslyn, Washington, Coal Field

By Joseph Daniels*

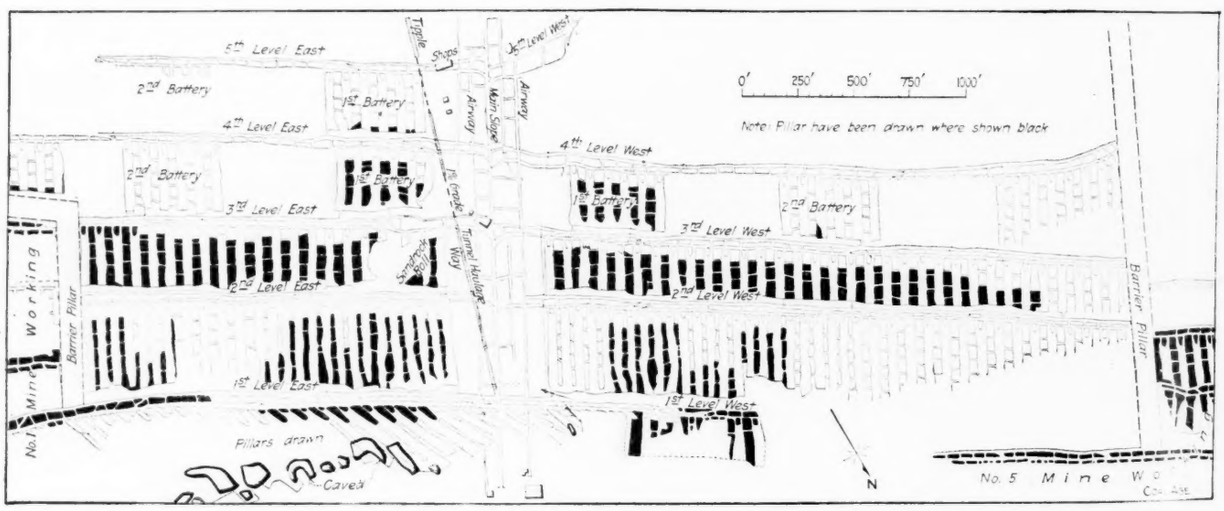
This is the second and concluding article on the Roslyn field, and discusses principally the methods of working. The room-and-pillar system is used exclusively, and coal is handled in the rooms by means of both chutes and gravity planes. The Washington wage-scale is given, together with some interesting notes on costs.

*Department of Mines, University of Washington, Seattle, Wash.

The room-and-pillar method of mining is the only system used in this field. One of the early mine inspectors' reports mentions that the longwall method was tried at one of the Cle Elum mines, but the experiment was not continued; it was also attempted in the Roslyn field, but abandoned there as well. No mining machines are in general use, although experiments are now being made with the Radialaxe puncher.

Methods of Working

The mines are usually opened with double slopes and entries, the cap rock being brushed to a sufficient height to obtain good headroom, about 5 ft. 6 in. above the rail. Slopes are driven from 10 to 14 ft. wide and the entries 9 ft. with 30-ft. pillars between. In some cases, the entries are driven 14 ft. wide and brushed for a width of 9 ft., the brushing being gobbed in the entry; the air course is not usually brushed.



Map of the Northwestern Improvement Co.'s Roslyn Mine No. 7, at Cle Elum, Wash.

Barrier pillars, 100 ft. wide, are established between adjacent mines, and strong chain pillars left to support the entries and slopes. The slope haulageway is usually made the intake and the air course the return. Some mines having three slopes, use the third either as a manway or an auxiliary return.

Room necks are driven 8 ft. wide, 40 ft. long, and both single and double rooms are used. The double rooms are 40 ft. wide, and have two room necks with a 24-ft. pillar between. Pillars between adjoining double rooms are 30 to 40 ft. wide; the general methods of working are clearly shown in the accompanying map. Single rooms under light cover are driven 24 ft. wide and have 20-ft. pillars. There are occasional variations from these general dimensions, due to the difference of cover or other local conditions.

Crosscuts are driven 6 ft. wide and on 60-ft. centers. Room necks are usually brushed. In single rooms the gob is packed on one rib and in double rooms it is placed in the center, back of the pillar stumps. For room timbers, 6-in. props are generally used throughout the district, and these are usually spaced 4 ft. 6 in. in each direction. Little timber is required along the entries.

Pillars of from 30 to 50 ft. in width are left between the face of the room and the next entry above. When the roof conditions will permit, rooms are driven up to the limit and the pillars immediately drawn back to the entry stump, which is left until the entry is finished. It is often necessary, however, to leave the pillars standing.

Retreating System

A modification of this method, known as the "battery and block" system, is in use wherever the roof is particularly weak. In this system, every alternate 12 rooms are left in as barrier pillars. The pillars in each room are drawn on the retreat back to the gangway; then the blocks are mined and robbed, beginning on the inside. The disadvantage of this method is that it ties up a great deal of coal and requires considerable dead work.

Insufficient pillars and a soft, shaly bottom rock have caused squeezes in some of the older sections. Where pillar coal is being recovered, a skip 10 ft. wide is taken along the room and pillar stumps for a roadway, and portions of the pillars are then removed on the advance up to the limit of safe working and the remainder taken out on the retreat.

Coal is mined by undercutting, shearing and shooting from the solid. The mining is done either in the bottom coal above the floor, in the middle coal and parting of the seam, or in the top coal. Occasionally the coal is sheared in the rooms, but this is confined more particularly to the entries. Shooting from the solid is practiced, although the method is not in general favor. Black powder, fired by squib, and Monobel No. 3, fired by fuse and cap, are most generally used. In some of the mines shot lighters are employed, but as a general rule, each miner fires his own shots.

Room Workings

The steepest dip in the field is 30 deg., while the average lowest is about 10 deg. Coal will run in chutes on the higher pitches, and this method is employed when possible. The chutes are of steel plate, 2 ft. wide, in convenient lengths, and are carried in a straight

line from the center of the room necks up to the face. The chutes extend out to the entry, permitting the cars to be loaded directly. "Bucking" the coal is sometimes necessary. Four men usually work in a double room, two on each side.

On the lighter pitches, the cars are taken up to the face of the room by a gravity-plane arrangement. The track along the entry is laid with the low side rail slightly below the other, in order that the cars may ordinarily pass the room switches, which have fixed points. Cars are switched into the rooms by simply forcing the wheels to take a turnout on the high rail. Just inside the neck of the room is another frog and switch with movable latches. One track is carried straight up along the rib and the other parallels it at a distance of 5-ft. centers. These rails above the latches are usually of wood 4x4 in. in cross-section, laid on ties spaced 5 ft. apart.

Near the face of the room, a wheel post is set, to which is fastened a 12-in. sheave. The rope is given a turn around the sheave and one end connected to the

VIEW SHOWING UNDERGROUND HAULAGE TURNOUT

loaded at the face, and the other to the empty at the bottom of the room. In this way the full car going down brings up the empty. The sheave is usually dragged by means of a wooden pin, and there are few runaways. The descending car always throws the latches, so that the next car will take the right track. Excess rope is coiled up and lengthened as required. Instead of having two tracks in each room neck of a double room, one track may be laid in each room and the rope passed over two sheaves at the face of the double room. This also requires a reversed or back switch on the main entry.

VENTILATION AND LIGHTING

The hill workings are usually free from gas and dust, but the dip workings in many cases have both. Several explosions and local fires have occurred in the past. All mines are ventilated by surface fans, assisted in some cases by underground "boosters." Many different types of fans are in use, both steam and electric.

The main haulageway in the slope mines is usually the intake, and the air is split at each entry, passing to the face by way of the top entry, and back to the return by way of the bottom entry or air course. Brick and wood stoppings are used, and overcasts are of wood, brick or concrete. In some of the mines, spraying is employed to lessen the dangers due to dust, and in one of the properties exhaust steam is turned into the intake. Slopes and entries are usually kept well cleaned.

Open lights are used wherever possible. The acetylene lamp is in high favor and seems to be displacing the oil lamp. Wolf safety lamps are used in gaseous workings, and electric lights to a limited extent at landings, pump rooms and the like.

Electricity is used entirely for signaling. In one of the mines, a return system is employed, in which hoisting signals ring at each level simultaneously with those in the engine room. Many of the mines have installed telephones.

As a rule, the mines are not very wet and electric pumps of the centrifugal and plunger types are most commonly used. These are generally run in relays on 500 volts, direct current.

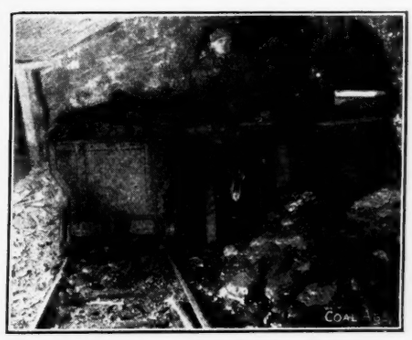
SURFACE EQUIPMENT

The surface equipment at most of the mines is very simple. The boiler and engine house, office, shop, and powder house, together with a simple tipple, make up the usual arrangement. The power plant, steel headframe, and tipple at the Roslyn shaft are the most pretentious structures in the entire district. Timber construction and housing of galvanized iron are uniformly used throughout the district.

The machinery and equipment are without exception uptodate and efficient. The N. W. I. Co.'s plant at Roslyn furnishes light and power for the mines in the upper part of the field; secondary plants, coupled in parallel with this at the lower end, supply the light and power around Cle Elum. Practically all of the tipple machinery in the field is electrically driven, and in a great many cases electric hoists are in use.

Coal is shipped to market as it comes from the mine without any further preparation than screening. Some picking is done in the mine whenever sulphur balls are found. The coal mined by the Northwestern Improvement Co. is used by the Northern Pacific locomotives and is not even screened before loading. The other mines in the district which supply the outside markets, screen the coal. Three types of car dumps are in use, the push-back or horn dump, the crossover, and the cradle. Some car pushers and return cars hauls are used and only one plant, the Beekman, has shaking screens; all the others have the usual stationary bar screens. The prepared sizes are run-of-mine, lump, steam and egg, and the sizes of these grades vary.

The rock and waste which come to the tipple, are usually dumped into rock chutes and loaded into 3-ton side-dump



PLATFORM AT BOTTOM OF CHUTE

cars which are hoisted by a rope over a bull wheel at the top of the rock pile where a tripper automatically opens the car doors and discharges the material.

LABOR

The labor around the mines is made up of English and Scotch miners, together with Italian and other Southern European races. In the early days of the district negroes were brought in to break a strike and since then there has always been a fair proportion of these among the mine workers. The miners are organized under the jurisdiction of the United Mine Workers of America, and are now working under the terms of a 2-year agreement which expires in September, 1912. In 1910, there were 1687 men employed on inside work and 300 on outside work at the various mines in the field. Ten fatal and 48

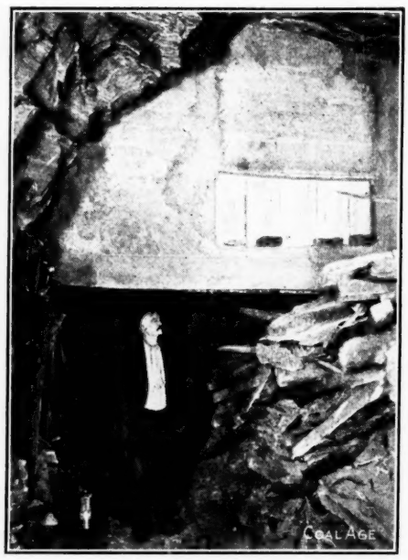
nonfatal accidents occurred during the year.

The mining towns through the field are cleaner than those commonly seen in other parts of the country. Many of the men own their own homes, and there are no dry houses at the mines although one is maintained at the Y. M. C. A. building in Roslyn. This institution is supported by both the company and the men. The miners also maintain a hospital and staff of doctors. In the past, the company has adjusted all damage claims directly with the men but under the new liability law in the state, they now contribute a certain amount which is used to pay out injury and death benefits.

The Northwestern Improvement Co. and the Roslyn Fuel Co. each maintain rescue apparatus and rescue squads. The former has six and the latter three sets of Draeger apparatus. At the first aid meet at Pittsburg last fall, exhibitions were given by a squad sent by the Northwestern Improvement Co.

Wage Scale

The scale of wages paid in the field is fixed by the agreement between the workers and the operators. Miners, timbermen, and tracklayers are paid $3.80,



Concrete Overcast with Explosion Door

shot lighters, $3.95, motormen, drivers and rope riders, $3.35, engineers and cagers, $3.40 and helpers $3.15. The rates for contract workers per long ton are 92c. for chute work, 95c. for ordinary room work where the cap rock is left up, $1.02 where 12 in. or less of cap rock is taken down, and $1.05 where more than 12 in. of cap rock is removed. Yardage prices paid for driving entries 14 ft. wide are $1.85 when the cap rock is left up, and $2.90 when brushed; 8-ft. entries are $3.40 per yd. Slope sinking is $3.70 and crosscuts in rooms $1.15 per yard.

The average cost of production for coal delivered on cars at the tipple is probably between $1.15 and $1.25 per ton, including all operating expenses except coal royalty, depreciation and overhead charges. The average value of the coal at the tipple is in the vicinity of $2.50, the average figure for all mines in the state in 1910 being $2.57½.

The Roslyn district is at present the largest and most consistent producer in the state. In the older workings, pillar coal is being recovered, and in the new mines, the improved methods are yielding increased percentages. In addition to this, there are many hundreds of acres of virgin coal awaiting development. It is safe to predict that the Roslyn field will continue to be the leading producer in Washington for many years to come.

West Virginia Mining Accidents

By F. C. Cornet*

A presentation of some interesting and comprehensive data regarding accidents in the West Virginia mines. The author concurs with Chief Inspector Laing in the view that safety will be obtained only by constant and close supervision. As compared with the Belgian mines he is of the opinion that the West Virginia operations are much the safer.

*Mining enginer, Charleston, W. Va. Note—Abstract of paper read before the West Virginia Mining Institute.

Statistics published by the State Mine Department show that during the fiscal year ended June 30, 1910, the average daily tonnage for each man employed inside was 4.21 long tons. Taking the whole United States, the corresponding average is 3.25 tons.

During the period considered there were killed inside the West Virginia mines, 56 men out of each 10,000 employed, as compared with 38 for the whole country. In Belgium, where the average daily output per man is one-half ton, they kill only 10 men out of each 10,000 employed.

From a long personal experience in both countries, considerng natural conditions alone, I am of opinion that the coal mines of West Virginia are immensely safer than the Belgian mines, which have the deserved, if unenviable, reputation of being the most dangerous in the world.

From the figures given above some would be inclined to deduct that, fatalities being less numerous where the average tonnage is smallest, the larger number of fatalities is the result of a greater rush in getting coal out. Nothing would be further from the truth. From personal experience I know that our West Virginia miners do not exert themselves harder to get out 4.21 tons of coal per day than do their Belgian brothers who produce only one-half ton.

The reason why they get out more coal on this side of the Atlantic depends 75 per cent. on better natural conditions, and 25 per cent. on the Belgians; for safety reasons, their laws prohibit using mechanical devices and appliances, without which most of our West Virginia mines could not be operated at all, notwithstanding their incomparably better natural conditions.

Accidents Caused by Falls

As in all other coal-mining countries, the largest number of fatalities in West Virginia is caused by falls of slate and coal. During the fiscal year ending with June, 1910, out of a total of 307 men killed inside, 215, or 39 out of each 10,000, were killed under falls.

This bad showing is hard to explain otherwise than by the victims' own carelessness, which accident reports bear out. It cannot be said that the mines where these accidents occurred had bad roofs. In fact, nearly all of said mines were reported as having fair roofs. Nor were the majority of those killed by falls green men; only 75 fall victims are reported as having had less than five years' experience in coal mines, while 94 had an experience varying from five to 40 years. Forty-six were so little known to the mine officials and others that the amount of experience they had could not be ascertained. I do not think I will be far wrong if I assume that one-half of these men had less than five years' experience, and the other half more than five years. That would make a total of 98 men killed who had less than five years' experience, and 117 who had not more than five years. Do not these figures show that greenness, or ignorance of mine work, is not at the bottom of the trouble?

Insufficient supervision on the part of mine officials and absence of discipline on the miners' side—the latter being a direct result of the former—are responsible for at least 75 per cent. of the deaths by falls. I fully agree with John Laing, chief of the mining department of

the state of West Virginia, who, in his report for the year ending June 30, 1910, states that operators should supervise their mine closely and every minute, day and night. Do not let anything escape observation and enforce rigid discipline.

The trouble is that in many mines too much is expected from the foreman. In the large mines it is seldom that the foreman has enough assistants to properly cover and police the workings. I have known mines where it was a physical impossibility for the foreman, no matter how good a walker he was, to see every place, on an average, more than once a week.

Foremen, as a rule, mean well, and are perfectly alive to their responsibilities. As a rule, also, they are handicapped by a lack of assistants. They should have enough assistants not only to inspect every place once a day, but oftener if necessary; that is, if safety to the men demands it. Safety, sometimes, may demand that an assistant foreman be left permanently for some length of time at one place or another in order to insure the carrying out of some order of the foreman.

It is all very well to say that if a man obeys orders only when watched by another he ought to be discharged; but it is a fact that very few men nowadays will allow themselves to be moved by fear of being discharged. Men are scarce. Nobody knows it better than the men themselves, unless it be the mine foreman. If a man is discharged he gathers up his tools and walks to the nearest mine, often a short distance away, where the foreman will be glad to give him a job without asking questions.

Haulage Accidents

During the year ended June 30, 1910, there were 56 fatal accidents from mine cars and motors. This is a large number, being equivalent to 10 out of every 10,000 employed. In this case, also, an examination of the accident reports shows conclusively that most of the casualties are due to the victims' own carelessness. This carelessness, no doubt, was aggravated by insufficient supervision. It is the same old story we have discussed previously. In this case we see miners riding to work or going home in cars or on motors, trapper boys jumping between two cars of a fast-moving trip in order to get a ride outside and reach home sooner. We see motormen and drivers driving at reckless speed, and also drivers riding on the front of cars, their legs swinging on one side and forgetful of the fact that it is on that side that there are a few places where the car clears the ribs by one-sixteenth of an inch, or less.

Are not these things familiar to many of us? Of course, there should never be any such tight places for drivers, or anybody else, to be caught in. That shows negligence on the foreman's part. It is a fact, however, that many such tight places could easily be found in many mines. There is no excuse for them. Manways, wherever practicable at all, should be provided. Where the operator has not provided any, and the men must use the haulage as a traveling way, the law should always be complied with, and regular refuges, duly whitewashed, provided. There are still haulages used as traveling ways on both sides of which the gob of many years lies piled several feet high, making escape difficult for those who happen to meet a trip in such a place.

There is also too much wildcatting of cars. It is not only a dangerous practice, but a costly one. In many instances it could be dispensed with to the pecuniary benefit of the operator, not to say anything of safety. Not only would it save life, but it would soon pay for itself in reduced wear and tear on the cars—the car wheels principally—cut down track repairs; and less coal would be lost from the cars. This coal, if not gathered daily—which is seldom done—is soon ground to dust and, in many mines, becomes a permanent source of great danger. There cannot be doubt in anyone's mind, after reading the accident reports, that the majority of haulage accidents are caused by the victim's own carelessness.

Electrocutions

During the year ended with the month of June, 1910, a total of 18 men were killed by electricity. Of these 15 were killed by a voltage exceeding 500, while only three were killed by a current not exceeding 250 volts. Not more than one-fifth of the mines in the state carry the higher voltage. They caused, however, five-sixths of the electrocutions, as against one-sixth chargeable against the lower voltage. In his interesting report for the year ending with June, 1910, Mr. Laing, calling attention to the subject, writes as follows:

> An electric current carried in a mine exceeding 300 volts is unnecessarily dangerous to life and limb, and no pecuniary consideration should ever be offered in extenuation of perpetuating methods that have resulted in such a sacrifice of human life.

The figures given above certainly justify Mr. Laing in his views. There are, however, several ways by which the fatalities from electricity could be notably reduced, and they apply to any kind of voltage, high or low. The trolley wires, very often, are not installed properly, the idea being too often to economize on the first cost without thinking of the future cost of maintenance. The wire is either too low or not far enough to one side of the track, no matter whether the road is a traveling way or not—which it often is. The hangers are often too far apart, and the wire sags too much.

The mines having manways are at a decided advantage when electricity is a factor. In such mines the men have no business near the trolley wires. When any kind of electric wire, no matter what the voltage or purpose, is run along a manway it should be protected by a durable shield made of boards running parallel with the wire.

Manway or not, all miners should be cautioned against carrying any auger or bar of any kind on their shoulders when in the vicinity of a wire, unless protected by wooden shield as just mentioned. It does not make any difference if the wire is insulated, because the best insulation does not keep in a mine.

The motors should always be kept in prime condition. This is practicable, and will go a long way toward avoiding dangerous, even fatal, shocks; for it will save the motorman many an occasion of tinkering with his motor, which too many motormen have a tendency to do, under pretense of effecting repairs.

With the wires and motors in perfect shape many causes of mortal and other shocks will be eliminated. There will also be fewer causes of short-circuitings or grounds. All this is perfectly practicable, and is the best paying way of dealing with electricity in coal mines; at least it is my experience.

Miners should never be allowed to ride on cars going to or returning from work. A man getting on or off a car on the wire side is very likely to receive a shock. Where there are no traveling ways, the men having to travel on the electric road, the wire should always be on the opposite side from the refuge holes. The place should also be well drained; for if the road is wet, or simply muddy, the men trying to dodge bad spots may come in contact with the wire.

Gas and Dust Explosions

With the exception of one solitary death from a gas explosion, the year ending June 30, 1910, so far as gas and dust are concerned, was a very fortunate one, following, as it did, two most disastrous years, during which 518 miners were killed by explosions of those two dangerous agents. These explosions had stirred public opinion to a high pitch. Then, for a whole year, the operators' vigilance, assisted by the untiring efforts and devotion to duty of the whole Department of Mines, were successful in keeping down the monsters. These, however, soon broke loose again in different parts of the state, each time making numerous victims.

For a period of 14 years, ending with June, 1910, explosions of gas killed 128 miners, while those dust-killed were 484. Comparing these figures with the number of men working inside, only 2.43 miners out of each 10,000 were killed by gas during the period considered, while 9.23

out of each 10,000 were killed by dust explosions.

It is readily seen that dust is by far the more dangerous agent, in a ratio of nearly four to one. Gas and dust taken together, during this 14-year period, were responsible for a total of 612 deaths, a proportion of 11.63 victims for each 10,000 employed inside the mines—much less than were killed by falls, but a great many more than are killed from all causes in the coal mines of Belgium. The latter are often 4000 ft. deep, and sometimes deeper. They depend for their coal on seams averaging hardly 2 ft. in thickness. These seams are sometimes as thin as 12 in. As a rule, the seams are faulty and pitch strongly. Sometimes they are vertical, or even inverted. Most of these seams are extremely gaseous. With very few exceptions all are dry, and an abundance of dust is a constant source of great danger.

In West Virginia we work on the room-and-pillar system, insuring ventilation from place to place by means of crosscuts, the maximum distance between crosscuts being fixed by law at 80 ft. If there is enough air in circulation and there is a crosscut right at the face that room may be what is called ventilated, but its face will not be swept in its entirety by the ventilating current. The corner of the room further removed from the crosscut will hardly be touched by the air, as is easy to ascertain experimentally.

Ventilation

If the seam liberates gas in any quantity a sweeping of the whole face by the ventilating current is the only thing that will remove gas in a positive manner. However, I am disposed, for an instant, to admit that when the crosscut is at the face the place is, for all practical purposes, sufficiently ventilated; but suppose the crosscut is 10 or 15 ft. behind the face? Then, I contend that, if the place liberates gas, it is not safe any more, no matter how much air runs through the last crosscut.

The weakest point about our ventilating system, is that, in a case when there is gas at the face, we depend on a fireboss to discover it. He may discover it in time, and condemn the place pending the building of a brattice; but, as our fireboss is a human being, he may err. He may not discover anything; he may even omit to visit the place, thinking that, since there has never been any gas found in it there is no use inspecting it any more, and pass the place as safe. The miner will walk into it a few moments later and ignite the gas. The chances are he will not live to tell about it. If there is dust lying around, the conditions are favorable for an explosion that may involve the whole mine and kill all the men in it.

Our ventilation system involves the sending of a man, or several men, to visit all the places to see if they are safe before the miners go to work. Ventilation in order to be safe must be positive, automatic, and sweep all faces as they advance, regardless of any inspection or brattice. With our room-and-pillar system such ventilation is not practicable.

In our best ventilated mines there is always a possibility of a place filling up with gas from the face down to the last crosscut. A body of gas thus formed may get ignited in the place itself, or it may reach the other places beyond, being carried there by the air current, and be ignited at any point. The body of gas may be large enough to cause considerable damage by itself if exploded; but if the explosion is propagated by dust, results may be a great deal worse. Automatic, positive ventilation would not allow of the formation of such bodies of gas. It removes the gas, particle by particle, as it comes out of the coal, sweeping it away, too much diluted to do any harm. With our present system of ventilation gas may be present in a gaseous mine at all times in some part or other of the workings.

Gaseous Mines

In a gaseous mine there is always present the great danger of small amounts of explosive gaseous mixtures getting ignited, from one cause or another. It does not take much gas to create, by explosion, such a big commotion as will be felt strongly in remote parts of a mine, raising clouds of dust in a hundred places.

A gas explosion, even of small proportions, may thus not only raise hundreds of dust clouds, but ignite as well the nearest of them. The inflammation, then, will run from dust cloud to dust cloud, creating a rapid succession of explosions, wrecking and killing everything in its path.

We may succeed, in our mines, to reduce the danger from gas and dust to a minimum, but we shall never be able to free them so completely of both these elements of danger as to be justified in disregarding them entirely. After taking all precautionary measures against gas and dust, it will be just as important to take such measures as will banish all causes of inflammation of either gas or dust.

In mines generating gas in appreciable quantity there is no place for naked lights. Electricity should not be used near the faces. All places should be cut by machine, in order to reduce to a minimum the chances of solid shooting.

Nothing but approved safety explosives should be used, bearing in mind that the safest of explosives ceases to be safe when more than its charge limit is used in one hole. This is too often forgotten by miners.

It should never be permitted to fire more than one shot at a time. When several shots are fired together, or in rapid succession, it is easy to understand that gas might be liberated and dust raised by the first shot and ignited by the next, even when safety powder is used.

Notes on Shooting

By all means the use of fine coal should be rigidly prohibited for tamping purposes. Before shooting the place should be tested for gas. When a mine is only dusty, and not gaseous, there is no danger from the ordinary naked lights, such as used by miners; nor is there much danger from electricity.

Of course, all places should be cut by machine, and solid shooting strictly prohibited. Explosives and shooting rules, the same as in gaseous mines, as described above. All these recommendations to minimize danger from gas and dust will go amiss if not carried out to the letter.

Miners, if left to themselves, have a tendency to revert to some more familiar explosive, like black powder. The miners would also be prevented from using too large quantities of explosive in one hole. This is an important thing, as the so called safety explosives are not safe if more than their charge limit is fired in one hole. We have all noticed the tendency of the average West Virginia miner to use absolutely too much explosive in his shots. That would not do with safety powder.

No large quantity of explosive should be carried by any one man, and no quantity of explosive, no matter how small, should ever be hidden away in a receptable, such as a box or a can. It would be well to remember that the most disastrous mine explosion in history, the dust explosion at Courrières, France, four or five years ago, was started by the accidental explosion of less than 2 lb. of a safety explosive, called "Favier," which had been hidden in a ventilation pipe of galvanized iron 20 in. in diameter. In this case there was no gas at all to help the explosion at the start, but there was dust aplenty. That dust explosion at Courrières killed more than a thousand men.

It will be remarked that I have not insisted on the ways and means of keeping down gas and dust. That is pretty well understood by all coal-mining men in our state. What is not so well understood, I believe, is the importance, just as great, of keeping out of our mines all causes of inflammation of gas and dust, even after we have done all that can possibly be done otherwise to remove danger from both sources. On this I have insisted at some length.

Points in Mine Ventilation

By J. T. Beard*

A multiplicity of theories involving some popular fallacies in mining textbooks. Misconception in regard to the diffusion of gases in mines. The limit of diffusion of gases. Detection of carbon monoxide in mines not made by observing lamp flame. Mistaken relation of pressure and power by early writers. Manometric efficiency, a useless term in comparing fans.

[Note—Paper read before Summer Meeting, West Virginia Coal Mining Institute, Charleston, W. Va., June 6, 1912.]

What we do not know about mine ventilation would perhaps make a larger book than the facts we know. It is often bewildering to find how limited is our knowledge of actual facts relating to coal mines and we are simply lost in the multiplicity of theories that are urged to account for the clearly observed phenomena of mining. Some of these theories are based on sound scientific principles while many others are pure speculation, having no foundation other than exist in one's imagination. While some of these theories, though useless, are equally harmless, others lead to dangerous practices in the mines that are not infrequently responsible for the loss of lives and property.

So great is the horror of mine disasters in which the mine may become a living tomb, that men charged with the responsibility of mining operations are often willing to accept and too prone to adopt any theory that has a semblance of plausibility. The present paper will confine itself to a brief discussion of a few of the fallacies that have crept into our knowledge of mine gases and the practice of mine ventilation. Mining textbooks are largely responsible for many of our misconceptions with respect to mine gases. They describe the physical properties of the gases commonly found in mines. The properties described, however, are those of the pure gas, such as methane or marsh gas, carbon dioxide, hydrogen sulphide, etc., as determined in the laboratory. Inasmuch as these gases never, we may say, occur pure in the mine, but are mixed in various proportions and diluted more or less than normal percentage of oxygen, it is easy to see that the mixed and generally diluted gases of the mine will possess properties that often differ widely from those described in the books. Too much emphasis has been placed on their physical properties and not enough on the behavior of the gas or gases in the mine.

Diffusion of Gases

The question of the diffusion of gases furnishes a striking example of the misconception that often exists in the practical mind, growing out of the failure of textbooks to properly treat the behavior of gases in mines. In these books diffusion is described as a rapid and intimate mixing of two or more gases. This is true, but the definition is not complete unless it states that the mixing is *uniform and in fixed proportions*. We often confuse *diffusion* with *mixing*, whereas the two processes are widely different. Gases *mix* together *in any proportion* and the mixture is not uniform, except as diffusion tends to make it so after a brief time. Diffusion, on the other hand, acts according to a fixed law, which is stated as follows: The rate of the diffusion of each gas is inversely proportional to the square root of its density.

This law of diffusion gives a definite mixture of the gases, providing the diffusion is complete and no other action occurs tending to mix the gases. It is interesting to know, in respect to the diffusion of marsh gas and air, that the specific gravity of marsh gas (CH_4) being 0.559, its square root is 0.748, or, say ¾, which makes the inverse ratio, in that case, 4/3 and shows that the diffusion of marsh gas into air would produce a mixture consisting of four volumes of gas to three volumes of air. This mixture would have a specific gravity of

4 vol. CH_4,	relative weight, 4×0.559	$= 2.236$
3 vol. air,	relative weight, 3×1.0	$= 3.0$
7 vol. mixture,	relative weight,	5.236

$$sp.gr. = \frac{5.236}{7} = 0.748$$

This mixture would be very "sharp" since it contains

$$\frac{4 \times 100}{7} = 57 + \textit{per cent.}\ CH_4$$

Its specific gravity being less than one, if undisturbed, it would collect at the roof, or at the face of a steep pitch.

The practical point to be noticed is that when marsh gas issues from the roof strata or from the coal face on a steep pitch, it is possible for this mixture to form and be mistaken for pure marsh gas. The question is often asked, "If the diffusion of gas is rapid, how is it that "sharp" gas is frequently found at the roof while the air below is practically free from gas; why does not this gas diffuse and fill the entry?"

To answer this question from a mining standpoint, it is necessary to remember that the very fact that there is a thin layer of gas at the roof and practically no indication of gas below, shows a uniform or undisturbed condition of the atmosphere. It is also necessary to note that as diffusion advances the density of the mixed air and gas rapidly approaches that of air; and when this point is reached further diffusion ceases. In plain language, the pure gas issuing from the strata is so rapidly diluted with air that diffusion practically ceases a short distance from the point of issue. The action is continuous for a depth below the roof, depending on the quantity of gas given off per minute, per lineal foot of entry, and the volume of air passing in the entry. The point to be borne in mind is that with a certain emission of gas from the roof per lineal foot of entry and a certain volume of air in circulation, diffusion is most rapid close to the roof and decreases in rapidity downward, each successive layer of air containing a less and less percentage of gas as the density rapidly approaches that of air when diffusion practically ceases.

Indications of Presence of Carbon Monoxide in Mine Air

In describing the effect of carbon monoxide on flame all textbooks mention particularly the increased brightness and the lengthening of the flame, due to the presence of this gas. It has been suggested, very properly, that this statement is misleading and may be the cause of many a miner losing his life in the attempt to rescue others after an explosion. This is true. It would be fatal to enter an atmosphere more or less charged with afterdamp, and depend for safety on the indications of the flame of a safety lamp.

It is true that a lamp flame is visibly lengthened and brightened in an atmosphere charged with the fine dust of an inflammable coal, which, in contact with the flame of a lamp, generates carbon monoxide that is burned at once on the surface of the flame to carbon dioxide. In this case, however, the gas is not present in the air, but is generated by the burning of the dust in contact with the flame. The same indications occurring in an atmosphere of afterdamp free from dust, would be accompanied with surely fatal results.

When it is remembered that carbon monoxide has the widest explosive range of any gas except hydrogen and that its lowest explosive limit is marked by a percentage of only 13 per cent., and its inflammable limit is still lower, probably less than 2 per cent., while ½ of 1 per cent. of this gas is fatal to life, it will be seen that it would certainly be fatal to depend on any indications of the flame of a lamp to warn one of the presence of this gas in the mine air, because the

indications would be observed too late, if at all.

Some surprise may be expressed that miners have been burned by this gas collected behind a standing shot when they have thrust a lamp into a crevice behind the coal to examine the effect of a shot, and yet have not been killed by the poisonous qualities of the gas. This is due, however, to the rapid diffusion of the gas exhausting itself a short distance away, by the equalizing of the densities of the gas and air, as previously explained. The percentage of gas falls below the fatal mark, a short distance from the place where it is formed.

Pressure and Power in Ventilation

In the early history of mining, ventilation was secured wholly by natural means or by the furnace. The basis of calculation was the motive column or ventilating pressure due to the difference in temperature of the upcast and downcast shafts. Little was said of the power producing ventilation. Later, when centrifugal fans came into general use as mine ventilators it was seen that either the power applied to the fan shaft, or the net power on the air, was the true basis of calculation.

The early writers on mine ventilation, Atkinson and Fairley, were good as far as they went; they were indeed remarkable for their clearness and simplicity. But as the theory and practice of ventilation became better known it was found that the old rule, *"Pressure varies as the square of the quantity of air in circulation"* was only true when speaking of a given mine or airway. But, when speaking of a constant power, the pressure varies inversely as the quantity of air circulated. For example, to double the quantity of air in an airway will require four times the pressure; but in order to obtain double the quantity of air with the same power, the pressure must be reduced to one-half the original pressure.

There are other important points that the early writers did not explain. They failed to give the mine its proper value and to make clear the fact that it is the mine resistance that establishes and determines the pressure, which the ventilator creates. The same fan run at the same speed and consuming the same power will yield a different quantity and pressure operating on different mines Keeping the power on the fan shaft constant, and turning the fan at practically a constant speed, as the pressure against which the fan operates is increased, the quantity of air is decreased; and *vice versa*, a decrease of pressure gives an increase in the quantity of air delivered.

If this is true it is plain that what has been termed the "manometric efficiency" of a fan does not describe the fan; because it is the ratio of the actual pressure developed to the theoretical pressure as determined by the formula.

For pressure, in pounds per square foot,

$$w.g. = \frac{12 \times 1.2}{1000} \frac{u^2}{g}$$

For water gage, in inches,

$$p = 0.002\, u^2$$

in which u = tip speed of fan (ft. per sec.).

If the mine resistance determines the actual pressure then the manometric efficiency describes the efficiency of that particular fan working at that particular mine and no other. At another mine, the same fan would show a different manometric efficiency. The term is, therefore, useless in comparing fans to determine the best type of construction. Fans must be compared on a basis of power, which determines the mechanical efficiency of the fan. This term properly describes the fan, being independent of the mine or the resistance against which the fan is operated.

There are numerous other points relating to fan ventilation that are being studied and revised today. Among these may be mentioned tandem fan installations, high-speed fans, the effect of short-circuiting the air on the speed of the fan; etc. Each of these questions furnishes ample opportunity for discussion that cannot fail to be instructive and to interest all who have mines to ventilate. The discussion of such matters as these often brings to light fallacies that have become deeply imbedded in the mind and which are hard to efface.

Only a few weeks ago one of the leading technical journals of England filled two of its columns in an attempt to prove that the cutting out of the mine resistance, by opening the doors at the top of the upcast shaft would cause the fan to run faster. It is needless to say the argument was based on a fallacy and, of course, proved to be a fallacy.

A short time previous, another fallacy appeared in one of the leading mining technical journals in this country, in the answer to a question asking for the discharge of a 4-in. siphon line rising 17 ft. in 800 ft. and then falling 75 ft. in 300 ft., giving it an effective head of $75 - 17 = 58$ ft., the entire length of the siphon being 1100 ft. One answer gave the discharge as 259 gal. per min., while another made it only 179 gal. per min. The fact is that this pipe would simply run dry in a short time because the atmospheric pressure would only cause a flow of 130 gal. per min. in the 800 ft. of 4-in. pipe, rising 17 ft., while the 300 ft. of 4-in. pipe, falling 75 ft., would discharge 330 gal. per min. under gravity.

This and other illustrations that could be given show the need of a more thorough knowledge of conditions before attempting to work out problems of this nature. The conditions affecting all mining problems are multitudinous and their consideration is important. It is the neglect to properly consider the conditions affecting a problem, that causes the frequent disagreement between theory and practice.

The Carbide Lamp in Mining

One erroneous idea, much needing correction, has become quite prevalent in regard to the carbide lamp. It is often asserted that this lamp will burn in an atmosphere of carbon dioxide (CO_2); that it is not dependent for its combustion on the oxygen of the air; and this argument has been used to press the claims of this lamp for mining purposes. These statements are both of them wrong. The lamp will *not* burn in an atmosphere of pure carbon dioxide; and it *is* dependent for its combustion on the oxygen of the air.

This is readily seen by writing the equations showing the reactions that take place; first, in the generation of acetylene gas from calcium carbide by the addition of a little water; and, second, in the combustion of the acetylene gas in air, forming carbon dioxide and water vapor; thus,

$$\underset{\text{Calcium Carbide}}{CaC_2} + \underset{\text{Water}}{2H_2O} = \underset{\text{Calcium Hydrate}}{Ca(OH)_2} + \underset{\text{Acetylene}}{C_2H_2}$$

$$\underset{\text{Acetylene}}{2C_2H_2} + \underset{\text{Oxygen}}{5O_2} = \underset{\text{Carbon Dioxide}}{4CO_2} + \underset{\text{Water Vapor}}{2H_2O}$$

It is readily understood that the acetylene gas generated in this lamp by the action of water on calcium carbide requires oxygen for its combustion and it can get this oxygen from no other source than the air.

What has led to the statement that the carbide lamp will continue to burn in an atmosphere of carbon dioxide is the fact, observed in mining, that the carbide lamp is not extinguished in blackdamp when other lights fail to burn. This is true; the carbide flame, like the hydrogen flame, is more tenacious than other flames. The hydrogen flame requires 4 times as large a percentage of CO_2 in the air for its extinction, as is necessary to extinguish an ordinary light; and the acetylene flame of the carbide lamp is similar in this respect.

It is a common mistake among mining men, who generally know better, to call blackdamp, carbon dioxide, whereas the blackdamp of mines is a variable mixture of air and extinctive gases consisting largely of carbon dioxide. It is possible for the carbide lamp to burn in this mixture because the mixture contains some available oxygen that supports the combustion. In this respect blackdamp is very different from an atmosphere of carbon dioxide, which contains no free or available oxygen. The carbide lamp, or any other flame dependent on oxygen for its combustion, would be extinguished in pure carbon dioxide.

In this connection, it is important to remember that the carbide lamp will burn in an atmosphere containing over 50 per

cent. CO_2, while 18 per cent. of this gas in the mine air may produce fatal results when breathed a short time. On this account, the carbide lamp is not a safe lamp to use in mine workings generating much blackdamp, any more than the electric lamp is safe in mines generating marsh gas. The lamp does not give sufficient warning of the danger to which the mine worker is exposed. The first intimation he has of the danger comes in the effects produced by the gas on his system; and these may prove fatal before he is found and removed.

I have tried in this brief way, to point out a few of the flagrant errors that exist both in the too generally accepted theories of mining as well as in the minds and practice of many good mining men. If the discussion of these points serves to impress the several fallacies on our minds, the paper will have accomplished its purpose.

Successful Store Management, in Relation to Coal Mining Communities

By Charles H. Lantz*

In nearly all mining communities will be found what is commonly called the "company store." This is a store owned by the mining company, or by a separate company with interlocking directors, organized and conducted to serve the employees of the operating company. The "company store" is almost as necessary from an operating standpoint as the mechanical equipment required for the production of coal, because a mining company without a store is often without men to work the mines.

It is hard to find a class of men who are more open hearted, generous and liberal than those working in and around mines, and their liberality is often to their own detriment, for in times of slack work or other reverses they are not financially able to meet their needs. Nearly every miner knows from experience how difficult it is to enter a community, served only by independent stores. He finds that credit is refused him on account of his being a stranger, and also because irresponsible persons in the past have failed to liquidate their obligations. While independent stores, as a rule, are liberal with their credit, they must at least confine it to people with whom they are acquainted.

On entering a community served by a company store the mine worker is advanced the amount necessary to purchase tools, or is at least told where these can be borrowed until such time as he is able to purchase them. The amount necessary for his maintenance can be drawn daily from his wages, and if married he can purchase the necessary furniture for housekeeping by means of small monthly payments and at no increase in the original price. He is made to feel at home in the store, is treated courteously and helped to know his fellow workers, for there is no other place where the men meet more frequently than in the company store.

In answer to the question: Does he pay more for these advantages and privileges than if it was not necessary for him to obtain them? I would say that in the case of a well managed company he does not. The successful store company must serve its patrons properly, and in order to do this must have a policy of conserving and improving its facilities for the economical handling of business.

The successful company has good credit whereby it purchases all merchandise at the most advantageous figures. It has a system of credits whereby the losses are almost *nil*, and the customers are not required to pay for the bad debts of other patrons. It sells only the best of merchandise; otherwise it would not be a successful company, and for the same reason, it uses standard weights and measures, giving as much as it can, instead of as little as it can, for the dollar. It has a volume of business that turns the stock rapidly, always insuring fresh merchandise, and at the same time reducing the selling cost. This allows the company to obtain a smaller profit than its competitors on individual sales and still make a good showing.

In a community where there are a number of stores of various kinds, which of necessity reduce the volume of business that each can obtain, with attendant increase in expenses, it is not reasonable to expect that the patrons of such independent stores can get the service, quality or just treatment that they receive at the hands of the successful company store.

It is not claimed that capital will be invested except with the expectation of profit, for profit making is the basis of individual and national prosperity. In organizing the store company, the holding company has a right to obtain revenue from it, but by using economical methods, the store can be made the source of such revenue, and at the same time distribute its merchandise to the advantage of the citizens of the community which it serves.

Since both the mining company and the store company are striving for one end—the success of the companies as a whole, without which the community must of necessity suffer, there should be a pleasant and coöperative spirit shown between employees of both departments. Loyalty to the company of which they are a part is essential to their mutual success.

The store company that serves the community faithfully and efficiently, cannot help but be successful and will eliminate all adverse criticism. By a study of the form and methods of the successful companies it will be found that they adhere to a just and equitable policy which not only reflects credit upon themselves but assures a peaceable and satisfied community.

*General manager, Buxton & Landstreet Co., Thomas, W. Va.

†Paper read before the West Virginia Coal Mining Institute, Charleston, W. Va., June 6, 1912.

New Geologic Map of Southwestern Pennsylvania

In the extreme southwestern part of Pennsylvania lies an extensive area which is rich in deposits of coal, oil and gas. About 1500 square miles of this region have been mapped by the Geological Survey, the latest contribution to this work being Geologic Folio No. 180, by M. J. Munn. This contains maps and a description of the Claysville quadrangle.

The Claysville quadrangle covers a part of the western portion of Washington County and a small area in the northern part of Greene County. It is underlain by the valuable Pittsburg coal bed, from which the greater part of the coking coal of southwestern Pennsylvania has come.

The geologic maps of this folio show in great detail the position or the "dip" of this coal bed in the entire quadrangle and the depth below the surface at which it may be found. It is believed by coal men that a large portion of the coal in this bed within the Claysville quadrangle has coking qualities.

Other coal beds overlying the Pittsburg coal are exposed at the surface over a large portion of the Claysville quadrangle. These beds, though of poorer quality and in places much thinner than the Pittsburg, may eventually become valuable as the better beds are exhausted. The coal beds of the quadrangle are estimated by the Geological Survey to contain 1,150,000,000 short tons.

West Virginia Examinations

The department of mines, of West Virginia, under the direction of Chief Mine Inspector John Laing, will hold examinations for certificates of competency for mine foremen and firebosses, at the following named places and dates: Welch, July 10 and 11; Glen Jean, July 17 and 18; Elkins, July 24 and 25; Fairmont, July 31 and Aug. 1; Logan, Aug. 7 and 8; Charleston, Aug. 14 and 15.

It is hoped that all mine foremen and firebosses, who are holding positions on the recommendation of their district inspectors, and have not yet secured certificates, will avail themselves of this opportunity, as they will not be allowed to hold these positions after this series of examinations. All others aspiring to the position of mine foreman or fireboss are also invited to take the examinations.

A Ventilating System without Doors

By H. J. Nelms*

The general use of doors in modern mines is gradually being dispensed with, and overcasts used instead. Many systems of mining have been devised to accomplish this, and the one here described embodies some unique and economical features.

*Castle Shannon, Penn.

Where mines generate large quantities of gas, the ventilation is usually the hardest problem to solve. The plan here shown is used in some districts and has been found practicable. It will be noted that no doors are used, the different splits being made by overcasts.

The customary practice in most mines using the three-entry system is to make the middle face entry the haulage road, the one next to the rooms the intake airway, and the other the return. By this system a door is required at all butts, and there are so many reasons why doors are objectionable that a ventilation plan, by which they can be eliminated, is most desirable.

Referring to the accompanying plan, it will be seen that the first and second entries are the intake airways and the third the return. The first butt entry is turned off the middle face entry at 90 deg. and connected with the first face entry by a 45-deg. slant. The second butt is turned square off the third face entry.

Method of Splitting the Air

The air coming in the first and middle face entries is split at the intersection with the first butt, a portion going in the butt entries and the remainder continuing in the main entry. The air enters the first butt entry under the overcast at the intersection of the first butt with the third face entry, travels to the face through the rooms off the butt entry and returns out the second butt to the third face entry. Here it meets the main return from the inside and passes out to the fan.

It is, of course usually necessary to put in regulators on the second butt entry. These latter are usually driven quite wide, about 14-ft., so that the velocity of the air is comparatively low, and much of the explosive dust is deposited. Since the second butt is never used as a traveling way, it may be sprinkled as much as desired, which will greatly decrease the possibility of a dust explosion.

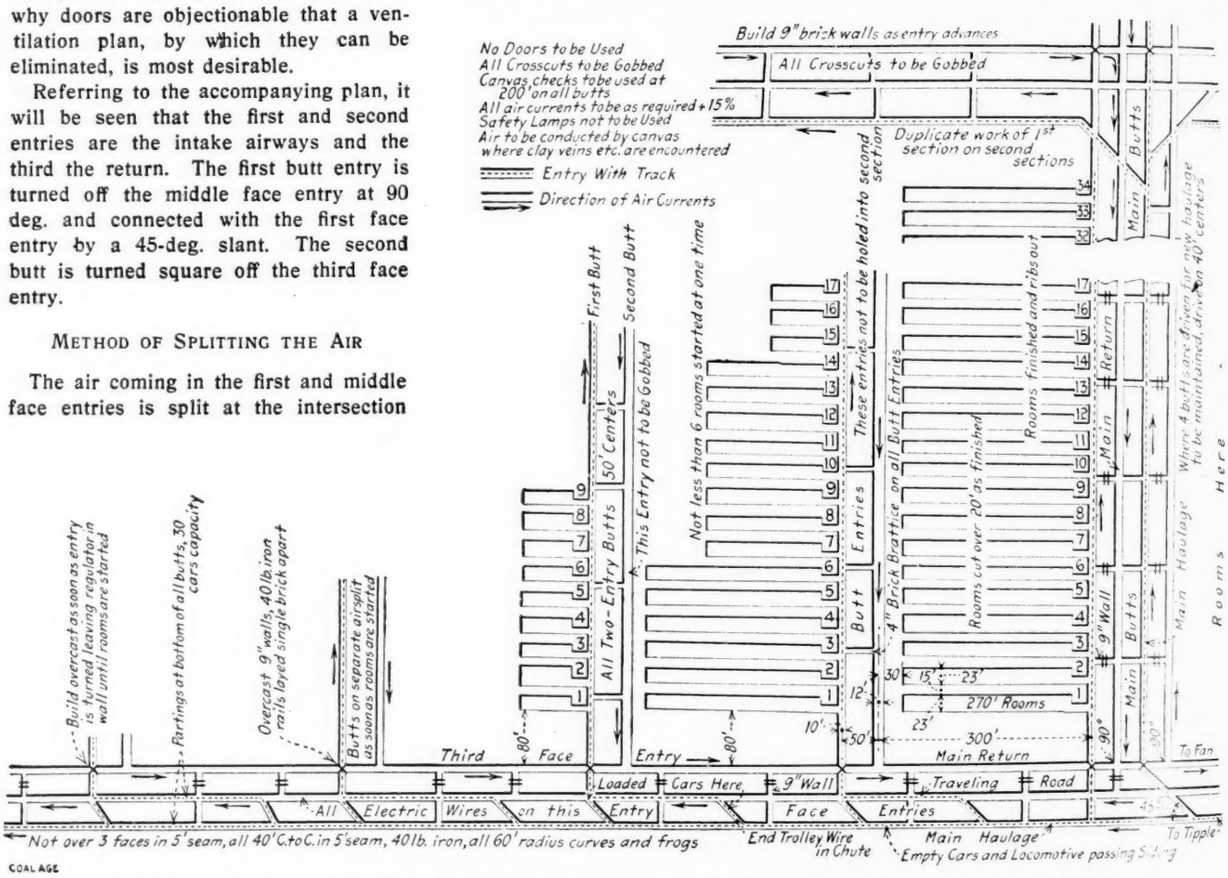
Haulage

The first face entry is made the main haulageway and, at the connection with each butt, a parting is established having a capacity of about 30 cars, which is about the heaviest trip the motors can haul. The motor usually takes 15 cars from two different entries thus leaving this number standing on each parting. The motor going in with the trip runs in on the side track of the butt entry requiring empties, drops 15 cars and then proceeds to the next where the remainder of the trip is left. Coming out it picks up the loads by backing in to the parting in the middle face entry.

Removing the Pillars

The pillars are best removed by cutting crosscuts through the room pillars about 12-ft. wide and leaving a stump of about 5-ft. of coal next to the gob. The stump is taken out as pick coal and this cuts that down to about 60 per cent.; it can usually be mined with little or no shooting.

While this general system of working may appear very expensive at first glance, it has been found highly economical in the end.



PLAN OF A 2-, 3- AND 4-ENTRY SYSTEM OF WORKING IN WHICH THE NECESSITY OF DOORS IS ELIMINATED

Ventilation has come to be one of the most important factors in the cost of the production of coal, as the energy of the miners depends in a great measure upon the purity of the air they breathe. Danger from gas explosions is also minimized by adequate air currents. Neglect of ventilation is a standing invitation to increased cost of production.

Central Station Power for Coal Mines

By Graham Bright

Mr. Bright takes as an example, a typical coal-mining installation and figures the comparative costs of central-station and locally generated power, showing the possible saving which may be effected by use of the former. A valuable discussion of data and methods for determining power costs.

Note—Paper presented at meeting of the American Institute of Electrical Engineers, Pittsburgh, Penn., Apr. 25, 1912.

In considering the application of central station power to coal mines the operator of today is sometimes at a loss to know just what saving will be effected, and for the following reasons: First, he believes that he is producing power at a fairly low cost, due to cheap fuel, simple apparatus and low cost of buildings; second, not knowing approximately what his present costs are in detail, he is at first unable to see the saving, if any, as compared with a definite rate per kw-hr. for central station power; third, the use of central station energy often requires the purchasing of new apparatus, and the selling of the present generating apparatus under unfavorable conditions.

In regard to the first reason, the cost of fuel is, of course, low at the mine, but its value should be figured at the price that could be obtained for it if sold. The water question, however, is often a serious one, and bad water in many cases occasions heavy expense for repairs. The boilers, engines and generators as a rule are the simplest and cheapest obtainable, there being little incentive to obtain high economy at a mine power plant. Reliability is the first requisite, and with the class of skilled help obtainable about a mine, this reliability can be obtained only with the simplest kind of apparatus. The buildings are generally of the cheaper forms of construction, and often have inadequate illumination, in which case the equipment does not receive the care it should.

In regard to the second reason, a certain rate per kw-hr. for power from a central station is not always an indication to the average operator as to what his total cost for power and his saving will be.

In regard to the third reason, in order to utilize central station energy it is usually necessary to purchase motors to replace the fan, hoist and compressor engines, and to purchase synchronous converters or motor-generator sets to replace the generators and engines driving them. The boilers, engines, pumps, old generators and piping must be sold and it is rather difficult to get much more than scrap value for these, if they have been in use for several years. If the proper depreciation on the old apparatus has been charged off each year, the value carried on the books should not be very high. The difference between the value of the old apparatus and the salvage obtained for it must be charged off, or the entire value of the old apparatus must be charged off and the value of the new apparatus put on the books as the difference between the cost of the new apparatus and the salvage obtained for the old. To provide for this change, new capital is required, and the members of the average board of directors must be assured of adequate returns before they will permit the expenditure of this new capital.

Method of Determining Comparative Costs for Power

The purpose of this paper is to show a method of determining the cost of power at an average coal mine with its own power plant, and what the cost would be if central station energy were purchased at some definite rate per kw.-hr. The values assumed are only approximate, as it is the method that is to be shown rather than actual values.

We will suppose that we are investigating a shaft mine, having the following list of power apparatus:

TABLE I. POWER EQUIPMENT

4 return tubular boilers, 18 ft. by 72 in. Steam pressure, 90 lb.
2 boiler feed pumps.
1 deep well pump.
1 feed water heater.
1 double balanced steam hoist. Max. hp. of engine, 400.
1 ventilating fan. Horse power of engine, 50.
2 high-speed 150-hp. engines for generators
2 100-kw. 500-volt d.-c. belted generators.
1 10-hp. engine for machine shop.
1 10-hp. engine for screen.
1 25-hp. engine for elevator.
1 5-hp. engine for coal conveyor to boiler room.
2 steam pumps at bottom of shaft, 10 hp. each.

The motors operated from the generators will have a combined capacity of about 500 hp. The generators will be operated about 20 hours per day, the time depending upon the amount of electric pumping to be done. Some of the coal cutting frequently is done at night, which tends to improve the load factor on the generators, the lights and pump load being, as a rule, a small percentage of the capacity of one generator. The hoist will operate 8 hours per day, with an occasional trip at night, or on non-working days. The fan will operate 24 hours per day. The tipple engines will work 8 hours per day, and the steam pumps and coal conveyor will work intermittently.

The mine under consideration has an average output of 1100 tons per day, and operates on an average 18 days per month all the year round. On days that the mine does not operate, one generator must be run to supply power for the pumps, lights and locomotives doing special work.

The operating force will consist of the following:

TABLE II. OPERATING FORCE

1 day engineer for the hoist.
1 day engineer for the electric plant.
1 night engineer for the electric plant.
1 day fireman.
1 day fireman's helper for wheeling ashes and helping around boiler room.
1 night fireman.

The wages of extra repairmen will be included in the upkeep and repair charges.

The amount of coal used under the boilers will be about 500 tons per month, and this coal being slack, or a mixture of nut, pea and slack, its value will be about 50c. per ton. In some plants it is necessary to use run-of-mine under the boilers, in which case the value is considerably higher.

Costs Figured on Monthly Basis

To obtain the cost of power per kw.-hr., it is, of course, necessary to first find out how many kilowatt-hours per day or per month are being produced. It is best to figure the costs on a monthly or yearly basis, in order to take into account the time lost when the mine is not operating. The cost per ton output for power will depend somewhat on the number of days per month or per year the mine operates, since a number of the items of expense go on just the same whether the mine operates or not. In this paper the costs will be figured on a monthly basis, taking the working days as the average per month for a year.

When obtaining the total kilowatt-hours, the load factor should be determined at the same time, since the rate of charge by the central station often depends upon the load factor. The load factor should be figured on the total five-minute, or some other short-time, peak rather than on the capacity of existing machines, since the engines and generators installed are often much larger than necessary, and their capacity is seldom reached by even momentary peaks.

The electrical kilowatt-hours, momentary and five-minute peak loads can easily be obtained by placing a watt-hour meter and graphic recording wattmeter or ammeter in the circuit of the generators for a 24-hour run, both for a working and a non-working day. The power developed by the steam engines driving fans, hoists, etc., is more difficult to obtain. If possible, these engines should be indicated, and from the cycle of operation, the horsepower-hours or kilowatt-hours can be computed for a working and

TABLE III. CAPACITY, KW-HR. AND LOAD FACTORS.

Machines	Five-min. peak	Capacity in kw.-hr., 24 hr.	Actual kw.-hr. for 24 hr.	Capacity in kw.-hr., 30 days	Actual kw.-hr. for 30 days
Generators	150	4,800	800	144,000	19,200
Fan	40	960	680	28,800	18,000
Hoist	60	1,440	336	43,200	6,080
Elevator	20	480	160	14,400	2,880
Screen	5	120	40	3,600	720
Machine shop	5	120	40	3,600	1,200
Conveyor	1	24	8	720	160
Pumps	12	288	120	8,640	2,400
Total	293	8,232	2,184	246,960	50,640

Load factor for 24-hr. working day = 26.6 per cent.
Load factor for 30 days = 20.6 per cent.

non-working day. Where it is not possible to use an indicator, the power taken by the fan engine may be calculated approximately from the size and speed of the engine, steam pressure, size and speed of fan, air pressure, and volume of air in cu.ft. per min. The power required by the hoist can be figured from the work being done and checked by the size and speed of the engine and the steam pressure. It is best to place the information in tabular form, so that ready comparison may be made.

Peak Load on Generators Less than Capacity

Table II shows the method of obtaining the total kilowatt-hours per month and the load factor.

In the first column are listed the various machines that are developing power. The second column gives the five-minute peak load for each machine. It will be noticed that for the generators this peak is less than the capacity, but this is almost universally the case in mine power plants. The fan engine runs at one speed during 10 hours of a working day, and at a speed requiring about one-half as much power for the remaining 14 hours, and for 24 hours of a non-working day.

The hoist has a peak load of about 300 kw. for five seconds, followed by a load of about 150 kw. for five seconds. The average time required for each trip will be about 52 sec., but for intervals of several minutes, this time may be as low as 35 to 38 sec. The five-minute peak is the average kilowatts for five minutes, with the hoist working at its maximum speed. At the average speed, this peak will be about 42 kilowatts.

The third column shows the capacity in kilowatt-hours of each machine if it works 24 hours. The fourth column indicates the actual kilowatt-hours during a 24-hour working day. The ratio of column 4 to column 3 designates the load factor for a 24-hour working day. Column 5 shows the capacity in kilowatt-hours for 30 days, 24 hours per day. Column 6 shows the actual kilowatt-hours for 30 days. This column is made up of the figures of column 4 for 18 days, plus the kilowatt-hours for 12 non-working days. The ratio between the values of column 6 and column 5 gives the load factor for 30 days. The load factor of a mine plant depends largely on the amount of fan and pump load, and may vary from 13 to 40 per cent.

Table IV shows the elements entering into the assumed installation together with the possible savings in these elements when power is purchased.

The interest, depreciation, repairs and upkeep are indicated for each part of the power plant. No saving is figured on the engine building, since it will probably be used for the new motor-generator and switchboard. This apparatus should be so placed that the hoist engineer can look after its operation during the day. For the night shift, a man can be obtained for about $60 per month.

Generators Selected for Peak Rather Than Average Load

In some cases where the generators are modern it may be advisable to retain these generators and purchase motors to drive them. As a rule, the average load on a mine generator is very much below its rated capacity. The peak loads are, however, rather high, so that the generators are really selected in regard to the peak rather than the average load. The type of load curve obtained on a mine generator is shown in some graphic charts in the paper, in the March proceedings of the Institute of Electrical Engineers, entitled "Central Station Power in Coal Mines," by W. A. Thomas. The older types of machines will not stand

TABLE IV. COST BASED ON ONE MONTH OF 30 DAYS.

Items Included in Cost		Total present cost	Amt. saved with purchased power
Three engineers at $85.00		$255.00	*$110.00
Two firemen at $75.00		150.00	150.00
One helper at $50.00		50.00	50.00
500 tons of coal at 50c per ton		250.00	250.00
Oil, waste and packing		50.00	40.00
Boilers:			
Cost, including stack	$4,000.00		
Feed pumps	200.00		
Setting and foundation	800.00		
Feed water heater	400.00		
	$5,400.00		
Interest at 5 per cent		22.50	22.50
Depreciation 7 per cent		31.50	31.50
Repairs and upkeep		50.00	50.00
Insurance		10.00	10.00
Boiler Building:			
Cost $2,000			
Interest at 5 per cent		8.35	8.35
Depreciation at 5 per cent		8.35	8.35
Upkeep and repairs		5.00	5.00
Engines:			
Cost Two generator engines	$3,000.00		
Hoist engine	1,500.00		
Fan engine	600.00		
Elevator engine	200.00		
Screen engine	150.00		
Conveyor engine	100.00		
Pumps	400.00		
Machine shop engine	150.00		
	$6,100.00		
Interest at 5 per cent		25.40	25.40
Depreciation at 6 per cent		30.50	30.50
Upkeep and repairs		30.00	30.00
Building:			
Cost $2,500			
Interest at 5 per cent		10.40	
Depreciation at 5 per cent		10.40	
Upkeep and repairs		5.00	
Piping:			
Cost $1,500			
Interest at 5 per cent		6.25	6.25
Depreciation at 7 per cent		8.75	8.75
Upkeep and repairs		15.00	15.00
Generator, switchboard and wiring:			
Cost $2,460			
Interest at 5 per cent		11.00	11.00
Depreciation at 5 per cent		11.00	11.00
Upkeep and repairs		15.00	15.00
Superintendence		25.00	
Taxes at 1 per cent. of valuation (assessment 90 per cent.)		15.00	7.50
Liability insurance at $1.33 per $100		6.65	4.15
Overhead		50.00	
Total cost		$1,165.45	$900.25
Fixed charges		284.40	
Operating expenses		881.05	

*Provides for attendance at $145 per month.

peak loads much beyond their rated capacity, and even if they would, the engines are seldom in condition to take care of these loads. This characteristic of the engines is really a blessing in disguise for the generators. A modern commutating pole generator driven by an induction or synchronous motor can be purchased to give 100 per cent. overload for short periods with little or no drop in speed and with good commutation. The retaining of the old generator would require a foundation for the motor, a belt, a coupling and probably an extension to the building. The total cost would about equal the cost of a new motor-generator set, while the latter will be a much more satisfactory combination. Synchronous converters are also used instead of motor-generator sets, depending upon the local conditions.

Other Charges

The item "superintendence" includes that part of the salaries of the master mechanic and superintendent chargeable to the production of power at the mine in question.

TABLE V. COST OF NEW EQUIPMENT

1 150-kw. motor-generator set	$2,800.00
1 switchboard	150.00
1 75-hp. induction motor with starter for fan	950.00
1 250-hp. induction motor with control for hoist	2,500.00
1 100-hp. induction motor with starter for elevator	400.00
1 10-hp. induction motor with starter for machine shop	170.00
1 10-hp. induction motor with starter for screen	170.00
2 10-hp. motor-driven pumps	650.00
Installing, including foundation, wiring and buildings	1,000.00
Total cost	$8,790.00

Taxes are figured at 1 per cent. per year, on an assessment of 90 per cent. of the valuation.

Liability insurance is figured on the payroll.

"Overhead" includes that part of the salary of the officers and clerks of the company and of the office expenses chargeable to the production of power, and should be the same proportion of the total overhead charge that the cost of power is of the total cost of production.

The total cost per month is $1,165.45, of which $284.40 is a fixed charge and $881.05 the operating expense. The saving per month with purchased power is $900.25. Since the total number of kilowatt-hours per month is 50,640, the total cost of power per kilowatt-hour is $0.023. The saving with purchased power will be $0.0178 per kilowatt-hour. The difference between these values, or $0.0052, is the common cost per kilowatt-hour, which will exist in either case.

Cost of New Equipment

In Table V is given a list and cost of the new equipment which must be purchased in order to utilize central station energy. Motors are provided to replace the present steam engines. All motors are alternating-current motors, and can be operated at any time, independently of the supply of direct current. In some cases it may be preferable to supply a direct-current motor for the hoist, in which event a larger motor generator is required. This increase may be in the form of a larger generator or of two generators driven by one large motor. One of the generators would be used for the direct-current supply for the mine and the other, with special control, for the hoist. If possible, the old hoist should be sold complete and an entire new electric hoist installed. In the present case,

TABLE VI. SALVAGE ON OLD EQUIPMENT

4 boilers with stacks		$400.00
2 feed pumps and water heater		90.00
2 150-hp. generator engines		600.00
2 100-kw. generators with belts and switchboard		600.00
Engine part of hoist		50.00
1 elevator engine		50.00
1 fan engine		75.00
1 screen engine		25.00
1 machine shop engine		25.00
1 conveyor and engine		30.00
2 steam pumps		50.00
Piping		50.00
Total salvage		$2,045.00
Total net cost		6,745.00
Interest at 5 per cent for 1 month	$28.00	
Depreciation at 5 per cent for 1 month	28.00	
Upkeep and repairs	15.00	
Total	$71.00	
Operating and fixed charges per kw.-hr. for new equipment		$0.0014

an alternating-current motor will be substituted for the steam engine at the hoist. A variable-speed alternating-current motor will be supplied for the fan. In many cases air compressors are used to supply air for punchers and pumps. It might be advisable to do away with air compressors entirely, and install electric cutters and motor-driven pumps, as the efficiency of the air system with its usual leaks is very low. However, in gaseous mines, it is sometimes considered dangerous to operate electrical apparatus, in which case a motor-driven compressor should be furnished.

One thousand dollars has been allowed in Table V for the installation of the new apparatus. This should be ample to provide for foundations, alterations in building, wiring and mechanical application. The total cost is $8790.

In Table VI is shown the probable salvage that could be obtained for the old apparatus. These estimates should be kept rather low, since it is sometimes difficult to get good prices for old machinery. The total salvage amounts to $2045. The net cost of new equipment will, therefore, be $6745. The interest, depreciation, upkeep and repairs on the new equipment will amount to $71 per month. This is at the rate of $0.0014 per kilowatt-hour.

Specific Costs and Savings

In Table VII some specific costs and savings are given. The total cost of power per kilowatt-hour, saving per kilowatt-hour with purchased power, and the common cost in either case, as before mentioned, are first shown. If the common cost is added to the cost per kilowatt-hour with new equipment, we have $0.0066 as the total cost per kilowatt-hour with purchased power exclusive of the charge of the central station. If this value of $0.0066 is subtracted from the total cost per kilowatt-hour of $0.023, $0.0164 is obtained as the central-station charge which would make the total cost of power the same as at present. In other words, if the central-station rate were $0.0164 per kilowatt-hour, the total cost of power would be the same as at present. Any rate below $0.0164 will, therefore, represent a clear saving. At a rate of $0.0125 per kilowatt-hour, the saving would be $0.0039 per kilowatt-hour, or $2375 per year, which is a saving of 35.3 per cent. over all charges on the new investment. At this rate, the change would pay for itself in less than three years. At a rate of $0.01 per kilowatt-hour, the saving would be $3980, or 57.8 per cent. At this rate, the change would pay for itself in less than two years.

TABLE VII. COSTS

Total cost per kw.-hr. for power	$0.023
Saving per kw.-hr. if power is purchased	0.0178
Common cost, in either case, per kw.-hr.	$0.0052
Net operating and fixed charges per kw.-hr. for new equipment	0.0014
Total cost per kw.-hr. with purchased power, exclusive of central station charge	$0.0066
Charge per kw.-hr. by central station which would balance present cost	0.0164
Saving per year at central station rate of $0.0125 per kw.-hr.	$2375
Percentage profit on net investment of $6,745	35.3 per cent.
Saving per year at central station rate of $0.01 per kw.-hr.	$3890
Percentage profit on net investment	57.8 per cent.
Present cost per kw. capacity (5-minute peak) per year for fixed charges	$11.65
Present cost per kw.-hr. for operating expenses	0.0174
Total cost per kw.-hr. with purchased power at $0.0125 per kw.-hr.	0.0191
Total cost per kw.-hr. with purchased power at $0.01 per kw.-hr.	0.0166

A coal operator will readily understand that in his isolated plant he will have certain fixed charges which will be practically the same whether his plant operates or not. His power cost can be divided into fixed charges and operating costs. A central station supplying power

TABLE VIII. GENERAL DATA

Average working days per month	18
Electrical kilowatt-hours per working day	800
Electrical kilowatt-hours per non-working day	400
Total steam and electric kilowatt-hours per working day	2,184
Total steam and electric kilowatt-hours per non-working day	944
Maximum electrical kilowatt demand, momentary peak	180
Maximum electrical kilowatt demand, five-minute peak	150
Maximum total steam and electric kilowatt demand, momentary peak	450
Maximum total steam and electric kilowatt demand, five-minute peak	293
Capacity of generators	200
Total kilowatt-hours per month	50,640
Kilowatt-hours per ton output, based on 19,800 tons per month	2.56
Present total cost of power per kilowatt-hour	0.0234
Present cost per ton output for power	0.0588
Cost per ton output for power with central station energy at $0.0125 per kilowatt-hour	0.0489
Cost per ton output for power with central station energy at $0.01 per kilowatt-hour	0.0425

for his mine will also have a certain part of its total cost as fixed charges. In many cases the fixed charges of the central station will be less than those incurred by the operator. The logical basis upon which to charge for central-station power would therefore be a certain fixed charge per kilowatt capacity of substation or kilowatt demand, plus a rate per kilowatt-hour which will be equivalent to the operating expense. In the present case, if the fixed charge were made $12 per year per kilowatt demand on a five-minute peak basis, the charge per kilowatt-hour would be $0.0067 to make the total cost equivalent to $0.0125 per kilowatt-hour. With the fixed charge system the total cost per kilowatt-hour decreases with the amount of power used. This is an incentive for the operator to extend the use of power as much as possible.

There are certain advantages that central-station power has over isolated plants that cannot be measured in dollars and cents, and in most cases, even when the fixed charge is the same as the operator would have in his own plant and the charge per kilowatt-hour is equal to his own operating expense, it would still be greatly to his advantage to purchase central-station power.

In Table VIII is given some general information in regard to the plant under consideration, showing the results of the tests and investigations, which should be made at a mine. The momentary and five-minute electrical peaks are obtained from the graphic records. These load curves are very interesting and show clearly the extremely fluctuating nature of the load, as well as the low average demand. The maximum momentary electrical load is often less than the continuous capacity of the generators. A modern commutating-pole generator of 100-kw. capacity would easily take care of the load where two 100-kw. old-type machines are used at present. A 150-kw. generator has been figured on to allow for the additional load of the pumps when changed to electric, and also to provide for future extensions. The information given in Table VIII will serve as a guide for the central station in determining the capacity of its lines, transformers, meters, switches, etc. The power required is 2.56 kilowatt-hours per ton mined. Since the cost per kilowatt-hour is $0.0234, the present total cost of power per ton mined will be $0.0588.

Conclusions

Summarizing the above information, the following reasons are given to prove the advisability of a mine's purchasing central-station energy rather than generating its own power.

1. Lower cost of operation.

2. Worry and care of power plant removed. The legitimate business of a coal operator is to mine and ship coal, and he should not try to carry on another business of so different a nature, at the same time. The efficiency of his plant will be greatly increased if he can spend his entire time in looking after the mining and shipping of the coal.

3. Reliability, which means greater production.

4. Much less expense involved in shutting down mine.

5. Capital needed for new power plant can be used for new development.

6. Increased output and additional power can be obtained quickly with small increase in capital.

7. Increase of production on account of increase of efficiency, due to ample power at all times.

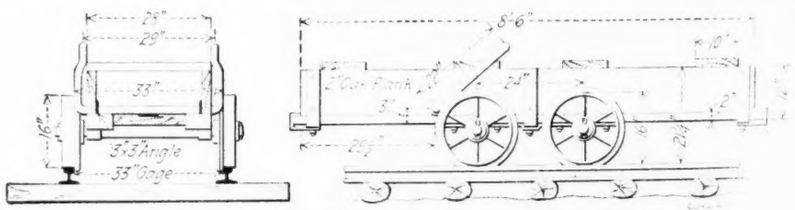
8. No change in speed of fan and pumps due to steam pressure falling occasionally.

About the only disadvantage is that additional capital is often required with which to purchase new apparatus, but when the large returns in the shape of decreased operating expenses are shown, this capital is not difficult to obtain.

Safety Device for Slope Car

By A. W. Evans*

The Rockwood slope of the Roan Iron Co., at Rockwood, Tenn., is located on the eastern escarpment of Waldens Ridge, at an elevation of 989 ft. above mean tide, and is driven through the conglomerate of the coal measures for a distance of 400 or 500 ft., until it intersects the Sewanee seam of coal, running thence, with the full dip of the seam, to its terminus, a distance of 4050 feet.



Safety Device for Man Car on Inclined Plane

The elevation at the foot of the slope is 592 ft., or 397 ft. lower than the portal. In hoisting coal, 20 mine cars are handled in each trip, the capacity of each car being one and one-fifth tons, and the running time 15 min. One-inch plough-steel rope is used. The mine cars are of peculiar pattern, having straight flaring sides and are of unusual depth. No one working in the mines is allowed to ride the loaded or empty trips, as the slope is tortuous in its ascent. Mr. William Richards, the superintendent, designed the car shown in Fig. 1, to convey the men to and from the working places.

In details of construction, the car is very simple, as will be noticed from the sketch. Double clevis hitchings are used. The feature deserving special mention is the device for catching the cars in case of the rope breaking or the hitchings giving away. This safety appliance is constructed of 1½-in. round iron, and bent as shown. When hoisting, the device is thrown back toward the rear of the car and drags the surface of the slope between the rails. Mr. Richards states that the catch is positive in its action. The bearings for the 1½-in. rod are located at the points where it passes through the sides of the car and are reinforced with 3x3-in. angle iron, which also serves to hold the sides in an upright position and to reinforce the car longitudinally.

*Brushy Mountain Coal Mines, Petros, Tenn.

The Record in Ship Coaling

There are those who assert that the average Asiatic laborer is not the most rapid and industrious in the world; but any naval officer who has had to go through with the disagreeable and dirty operation of ship-coaling, can confidently state that there are occasions and conditions, when there is little left to be desired in the way of rapidity of movement on the part of the coolie.

Up to a recent date the maximum rate of ship-coaling, was about 50 tons per hour. In November, 1905, however, the record was set at 92 and in February of 1906 even this record was surpassed by 8 tons per hour, bringing the average up to double that which was considered fair a few years ago.

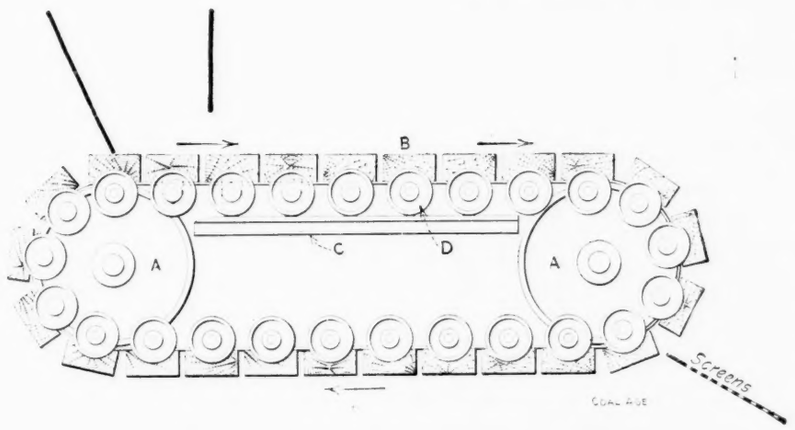
It must be remarked in this connection that there is a limit to the space at which coolies laden with coal can run up a gang-plank, and also to the minimum distance between coolies on that plank. Thus in order to increase the delivery there are necessarily either more gang-planks and bunker-openings, or a more favorable position of the coal pile.

Be that as it may, the record for speed in coaling has again been raised by the British ship of war "Terrible," on which 1150 gross tons were brought and stowed away in 7½ hours—which figures out to about 150 tons per hour; in this case there were 8 bunker openings. During the liveliest time of this coaling the rate was 180 tons per hour.

Feeding Device for Tipple Screens

There are many coal-mining plants at which, on account of the lack of necessary tipple height, it is impracticable to have bar screens of sufficient length to properly screen the coal. In any case, one of the principal difficulties encountered in screening coal is the fact that where it is dumped directly from the mine cars onto the screens, the material passes down with a rush in large masses, carrying with it an undue proportion of small sizes and slack.

At the mine of the Carr Wood & Coal Co., near Lytle, Tex., the device shown in the accompanying sketch was devised by Mr. Carr to obviate this difficulty. The extra amount of power required to operate the attachment is so slight that it may be ignored. The mine cars dump in the usual manner, but the coal, instead of falling directly onto the screen bars, goes into a hopper, beneath the bottom of which passes a moving belt, constructed as hereafter described. This belt, being in continuous motion, conveys the coal from beneath the hopper, and delivers it upon the screens at uniform rate.



TRAVELING BAND FEEDER FOR TIPPLE SCREENS

The apparatus has proved wholly satisfactory and is constructed as follows: The drums *A* may be made of any convenient material, and connected, preferably by sprocket and chain to the motive power. They should be approximately 4 ft. long, or extend at least 3 in. each side of the hopper bottom, and be placed not less than 4 or 5 ft. center to center, parallel and horizontal.

The belt consists of an endless strip of heavy canvas, brattice cloth or other available material, whose width equals the length of the rollers. To this cloth belt are attached, on the outside, wooden strips *B*, 2x4 in. by 3 ft. long, placed side by side to form a continuous circuit around both drums. The whole is made sufficiently tight to revolve when the drums are placed in motion.

Between the drums, on the upper path of the belt, should be placed a short section *C* of mine rail to provide a track for the small wheels *D*, placed on the ends of each strip *B* and thus prevent sagging of the belt from the weight of coal in the hopper. It is obvious that after passing over the forward roller *A* on the return run these wheels need no support until again reaching the upper portion of the circuit. The strips *B* may be placed loosely, side by side, forming a transversely rigid, but longitudinally flexible support for the belt.

A simple slot and screw adjustment of the axle of one of the rollers *A*, is provided for loosening and tightening the belt. The whole apparatus may readily be constructed at any mining plant and with friable coals, or tipples having short or steep screens, will readily pay for itself.

Coal Land Development in Southern Utah

A coal-land and railroad transaction involving ten million dollars is being consummated by William G. Sharp, president of the United States Smelting, Refining & Mining Co. The coal properties are in Emery County, Utah, and the projected railroad is to be built from Provo to Mohrland, which is in the heart of the coal district.

That there is a plan under way to consolidate additional coal-land holdings in the Emery County zone and to create an extensive system of coal mines under one head is shown by pending negotiations for further purchases. Foremost among the interests named as the possible purchasers of the properties involved, are the United States Smelting, Refining & Mining Co. and the Davis coal combination of West Virginia. Mr. Sharp has been at work on the transaction since the first of February and has been assisted by Thomas Davis, who is at the head of the Davis coal interests.

The details of the transaction which have thus far come to light are as follows: Stock in the Castle Valley Coal Co. to the amount of $750,000 has been taken over by Mr. Sharp. The entire issue of Black Hawk coal mine stock, at a price said to be $600,000, has been transferred to him, and an option on Consolidated Fuel stock to the extent of $1,200,000 is arranged. In addition to these purchases, Mr. Sharp is assuming responsibility for outstanding bonds as follows: Castle Valley Coal Co., $1,200,000; Consolidated Fuel Co., $80,000. The estimated cost of the Utah Coal R.R., from Provo to Mohrland, is placed at $5,000,000, thus bringing the total amount involved up to $9,550,000. Stock is still outstanding as follows: Consolidated Fuel Co., $1,050,000; Castle Valley Coal Co., $800,000; making a total of $1,850,000.

THE UTAH COAL R.R.

The route of the Utah Coal R.R. will follow the main line of the Denver & Rio Grande south to Thistle. Then it will parallel the branch line running to Marysvale until it reaches Hilltop, here turning east and south to Mohrland. The maximum grade to Hilltop will be 1 per cent. and from Hilltop to Mohrland the grade will not exceed 2 per cent. The line will be 90 miles long. The outcroppings of the great coal measures are first encountered on the trip down from Hilltop, at an altitude of 8000 ft. The seams can be traced along their exposed outcroppings for a distance of 175 miles within the state of Utah. In fact, the same measures have been followed with comparatively slight breaks all the way down into Mexico. The beds along the line of the proposed railroad are anywhere from 18 to 32 ft. in thickness and as many as five are exposed in most places.

The new railroad will connect with the Castle Valley R.R. at Mohrland, making a continuous line through the coal region to Price. At present, the mines at Hiawatha and Mohrland and those along the route of the Castle Valley R.R. ship their coal to Price by this line and from there, it is carried to distributing points by the Denver & Rio Grande. Heretofore the great drawback complained of has been the inability of the Denver & Rio Grande to supply sufficient transportation facilities.

Thousands of acres of coal lands are available to the big interests that have entered this field. Aside from the properties that have been taken over and are being negotiated for by Mr. Sharp, large tracts are held by former United States Senator William H. Clark, P. J. Quealey, J. H. Mays and W. S. McCormick.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Nitroglycerin

A bulletin of the Bureau of Mines, written by Walter O. Snelling and C. G. Storm, makes the following statements among others:

"Nitroglycerin begins to decompose at temperatures as low as 122 deg. or 140 deg. F. At a temperature of 158 deg. F., the commercial article evolves enough nitrous fumes to give a decided test with potassium-iodide-starch paper at the expiration of 15 to 30 min. Moreover, nitroglycerin even at very low temperatures tends to be somewhat volatile, and it is a well known fact that even at ordinary room temperatures it loses slowly in weight through volatilization. At somewhat higher temperatures, both its decomposition and evaporation increase.

Boiling Nitroglycerin

At a temperature of about 275 deg. F., the decomposition of nitroglycerin is so rapid that it causes the liquid to become of a strongly reddish color, owing to the absorption of the nitrous fumes resulting the decomposition of the liquid; and at a temperature of about 293 deg. F. the evolution of decomposition products is so rapid that at atmospheric pressure ebullition begins and the liquid "boils" strongly. This "boiling" is due in part to the evolution of decomposition products (mainly oxides of nitrogen and water vapor) and in part to the actual volatilization of nitrogen itself.

The decomposition is accompanied by the evolution of much heat, and as soon as ebullition has begun, enough heat is generated by the liquid to raise the temperature of the mass rapidly, unless some means is provided for conducting away the heat which is evolved. At temperatures between 293 and 419 deg. F., the ebullition of nitroglycerin becomes more and more violent; at higher temperatures the amount of heat produced by the decomposing liquid becomes proportionately greater, and at about 424.4 deg. F. nitroglycerin explodes.

Decomposition

When nitroglycerin is maintained at a temperature between 293 and 410 deg. F., its decomposition goes on rapidly, accompanied by much volatilization, and under these conditions nitroglycerin may be readily distilled. The distillate consists of nitroglycerin, nitric acid, water and other decomposition products. The residue which remains after heating nitroglycerin for some time under such conditions probably consists mainly of glycerin, with small amounts of dinitroglycerin, mononitroglycerin and other decomposition products. These substances are far less explosive than ordinary nitroglycerin, and accordingly by heating nitroglycerin slowly it can be caused to "boil" away, until the residue consists of products that are practically nonexplosive. In a number of experiments, nitroglycerin was thus heated, and a copious residue was obtained. By carefully raising the temperature, this residue could be made to char without explosion.

Departures from Standard

The temperature at which ebullition of nitroglycerin begins at normal atmospheric pressure was found to be 293 deg. F. This result is correct within four degrees, although different samples of nitroglycerin naturally have somewhat different ebullition points, depending upon acidity, length of time of storage, etc. The temperature at which explosion is brought about (424.4 deg. F.) should be accurate within about nine degrees, differences being due, not to the method of testing, but to the individual variations of different samples of nitroglycerin.

Rotting Mine Timbers

G. B. McDonald, in the "Iowa Engineer," makes the following comment on the action of fungi and bacteria in destroying mine timber. Decay in wood is an organic process caused by low forms of plant life, either bacteria or fungi. The bacteria are microscopic in size, but the fungi become conspicuous when the fruiting bodies appear on the surface of the wood. The fungi consist of small vegetable threads which penetrate the wood structure, and these are the real cause of decay rather than the fruiting bodies commonly known as punks, or brackets. Under proper conditions the spores produced by the fungi gain access to the wood structure, and decay soon begins.

The spores of the rot-producing fungi may gain access to the timber either before or after the timber has been felled; however, it is generally the case with mine timbers that the disease is contracted after the timber has been placed in the mine, due to its proximity to other decaying timbers. A rough wood furnishes excellent places for the lodgment of spores, and also good conditions for holding moisture, thus hastening the process of decay. Although timbers may have been sufficiently treated externally with some good preservative, the spores often gain entrance to the interior of the stick through season-checks or cracks which are not thoroughly protected by the preservative fluid.

It is frequently the case that a fungus is growing in the timber before the tree is felled. If the fungus is subsisting on live wood, and is not able to survive on dead tissue, the felling of the timber causes the death of the fungus and avoids further decay from that source. If the fungus is developing in the heartwood of the tree, which is practically dead tissue, the rot may continue to develop after the tree has been cut down and worked up into mine timbers.

Wood is composed of small cells, which are made of cellulose; around these cells is a substance known as lignin. Some species of fungi attack only the cellulose of the wood, others only the lignin around the cells, and still others disintegrate both lignin and cellulose, causing a complete breaking down of the wood structure. After the wood is first attacked by a fungus, discoloration takes place, and later the wood fibers are changed to such an extent as to make the wood soft, brittle and practically worthless for any purpose.

Any fungus must have for its proper development a supply of moisture, heat, air and food. Without any one of these the fungi cannot develop. In places where the timbers are constantly dry there is no danger of rot-producing fungi doing damage. The conditions which hasten the rotting of timber are those where the wood is constantly subjected to alternate wetting and drying. A good circulation of air is also an important factor in preserving timber in a mine, in that it tends to reduce the amount of moisture present. Shafts where ventilation is poor and where there is an abundance of moisture and heat are the most favorable for the development of fungus diseases. Although the loss of mine timbers can never be wholly prevented, yet their life can be very materially increased through proper methods of seasoning and preservative treatment.

For all classes of round timber, either posts, piles, or mine props, it is thoroughly understood that the removal of

the bark prevents decay to a certain extent. This is due to the fact that while the bark is on, the wood adjoining the inner bark is kept constantly moist, and the conditions are ideal for the development of fungus. The peeling is effective inasmuch as it hastens the seasoning process. The cost of peeling is an item which must necessarily be considered.

However, we are told by the Forest Service that it costs only from 20c. to 50c. per ton to peel mine timbers. It is no doubt true that many times this amount is saved by the increased length of life of the timbers. The simplest means of materially increasing the life of wood is by proper seasoning. It is well known that the amount of moisture in any piece of green timber depends upon the part of the tree from which the timber has been cut. The outer zone of a tree, or the sap-wood, contains a much greater amount of moisture than the heart-wood. On this account, and for the reason that the outer zone is more exposed to fungus spores, the sap-wood is more subject to decay than the heart-wood.

On the other hand, the sap-wood portion of a tree will season more rapidly than the heart-wood portion. By piling the timber in such manner as to permit a free circulation of air the seasoning process can be accomplished quite rapidly. The time required for the seasoning depends to a large extent on the climate. By kiln drying the moisture content of the timbers can be reduced to a smaller per cent. than by the mere process of seasoning; however, this will add a considerable item of expense.

It is well known that by reducing the moisture content the strength of the wood is materially increased, provided that an excessive amount of moisture is not driven off so that the wood structure is affected. A piece of timber well saturated with moisture is generally considered about one-half as strong as a properly seasoned stick.

Compensation

The first country to adopt a comprehensive system of accident compensation on a national scale was Germany in 1884; Austria followed in 1887, and since then practically all industrial foreign countries have adopted this plan, with greater or less modifications. Disregarding acts affecting only selected groups of workmen, the following list shows the order in which the various countries passed laws providing national systems of accident compensation: Germany, 1884; Austria, 1887; Norway, 1894; Finland, 1895; Great Britain, 1897; Denmark, 1898; Italy, 1898; France, 1898; Spain, 1900; New Zealand, 1900; South Australia, 1900; Netherlands, 1901; Greece, 1901; Sweden, 1901; Western Australia, 1902; Luxemburg, 1902; British Columbia, 1902; Russia, 1903; Belgium, 1903; Cape of Good Hope, 1905; Queensland, 1905; Hungary, 1907; Transvaal, 1907; Alberta, 1908; Quebec, 1909. The State of New York also passed a compensation law in 1910.

Canadian Fuel Production in 1911

By John McLeish*

The long continued strike which took place in the coal mines of southern Alberta and eastern British Columbia, was responsible for a considerable falling off in the coal production of Canada, in 1911.

The total production during the past year, comprising sales and shipments, colliery consumption and coal used in making coke is estimated at 11,291,553 short tons, valued at $26,378,477. This is a decrease of 1,617,599 tons or nearly 12.53 per cent. from the production of 1910, which was 12,909,152 tons, valued at $30,909,779.

There was an increase of 562,978 tons in the Nova Scotia production; that of New Brunswick remained practically stationary while an increase of about 23,097 tons is shown in Saskatchewan.

In Alberta, the decrease was about 1,396,412 tons or 48 per cent. and British Columbia also shows a falling off of 794,243 tons or nearly 24 per cent.

The production by provinces was approximately as follows:

Province	1910 Tons	1911 Tons
Nova Scotia	6,431,142	6,994,120
British Columbia ...	3,330,745	2,536,502
Alberta	2,894,469	1,498,057
Saskatchewan	181,156	204,253
New Brunswick ...	55,455	55,781
Yukon Territory ...	16,185	2,840
Totals	12,909,152	11,291,553

The exports of coal in 1911 were 1,500,639 tons, valued at $4,357,074 as compared with exports of 2,377,049 tons in 1910, valued at $6,077,350, a decrease in exports of 876,410 tons.

Imports of coal during the year include bituminous 8,905,815 tons valued at $18,407,603; slack 1,632,500 tons, valued at $2,090,796 and anthracite 4,020,577, valued at $18,794,192, or a total of 14,588,892 tons valued at $39,292,591. The imports of coal in 1910 were, bituminous 5,966,466 tons; slack 1,365,281 tons and anthracite 3,266,235 tons, or a total of 9,872,924.

The total production of oven coke in 1911 was 847,402 tons valued at $2,340,674 as compared with the production of 902,715 tons valued at $3,462,872 in 1910. The total quantity of coal charged to ovens was 1,228,700 short tons.

By provinces the production was, Nova Scotia, 469,305 tons; Ontario 259,554 tons (made from imported coal); Alberta 36,216 tons and British Columbia 82,327 tons. All the coke produced was used in Canada with the exception of 9290 tons sold for export to the United States.

The quantity of coke imported during the calendar year was 751,389 tons, valued at $1,843,248 as compared with imports of 737,088 tons, valued at $1,908,725 in 1910.

*Chief of the Bureau of Statistics, Mines Department of Canada, Ottawa.

Note—Abstract from the Preliminary Report on the Mineral Production of Canada.

Promising Coal Fields in Arizona

Although Arizona has produced no coal on a commercial scale, it contains promising fields, which may be profitably exploited when transportation is afforded and when population and manufactures have reached a point which will provide a market for the output. The more important of these fields are the Black Mesa coal fields, in the Hopi and Navajo Indian reservations, which are included within Coconino, Navajo, and Apache counties, and the Deer Creek field, in the extreme eastern end of Pinal County.

The U. S. Geological Survey estimates that the coal land in the Black Mesa fields covers 5920 square miles, and that the fields contain 14,082,000,000 short tons, of which 8,000,000,000 tons are recoverable, the rest being under very heavy cover. The Deer Creek coal field includes an area of 30 square miles in the middle of the copper-producing region of Arizona, and, estimating that 24 in. of coal extends through the 30 square miles, the coal beds contain about 60,000,000 short tons.

In these fields there are two grades of coal—one a hard black coal, well adapted for transportation and for commercial uses and also possessing some coking quality; the other a soft, badly crushed coal, which carries a high percentage of ash and could probably not be marketed except locally. It is believed, however, that as this lower grade of coal is high in volatile matter it could be used for the manufacture of gas, to be piped to the places of consumption or used in the development of electrical power.

For the regenerative-flame arc lamp, the following advantages are claimed: 1. It is the only lamp combining the high efficiency of flame lamps with the long life of the inclosed lamp. 2. Long burning hours, 70 to 100 hours on one pair of carbons. 3. Low cost of carbons, 10 hr. for 2c. 4. High candle-power, 4000 candle-power maximum at 15 deg. from horizontal. 5. It is the most efficient method of lighting, replacing four to eight of the ordinary type of electric arc lamps. For colliery and shaft-head lighting a gas, fume, and waterproof case is provided.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

The coal industry is full of champions. We have champion drillers, champion loaders, champion rescuers, champion transitmen, and some men are champion salary grabbers. In the matter of figuring out things Frank Haas, consulting engineer of the Consolidation Coal Co., Fairmont, W. Va., has the longest head and is captain of all the specialists in his line.

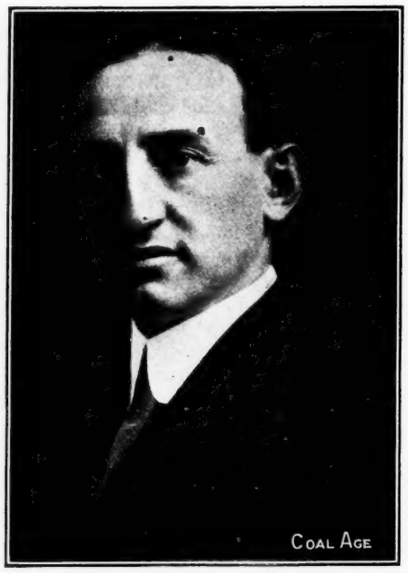
When it comes to exploding theories, Frank can slip up, ignite your pet idea, and get away before you know the durn thing is aflame. And, talk about "being from Missouri," well, Sir! the fellow who coined that expression meant Dayton, Ohio, and was looking straight at "F. H." when he uttered the words. Mr. Haas is the proverbial and original "show me," for every scheme that is presented for his approval not only has to be properly introduced, but has to eat, sleep and hold hands with him before anything resembling an "O.K." label is attached.

"Research" is his first name; "analytical" his middle appellation. With him a thought commences as an impression, strengthens to an idea, grows to a purpose, and culminates in action. He believes that the only way you can slowly master the whole is to dwell carefully on the details. Things invincible in their collective capacity, and in a state of union, gradually may be overcome when they are separated, and it is this habit of going to the bottom that has placed "F. H." at the top of his profession.

Born at Dayton, Ohio, in 1873, Frank Haas was educated at the common and high schools of his native town. Later he entered the Ohio State University, and in 1895 received the degree C. E. The following year was spent in post-graduate work, for which he received an E. M. degree.

In 1897, Mr. Haas was appointed chief chemist for the National Steel Co., Sharon, Penn. He remained at Sharon until 1899, when he was made superintendent of the Southern Coal & Transportation Co., Berryburg, W. Va. Leaving this latter position in 1900, he accepted a place as chemist and superintendent of Watts Furnaces, Virginia Iron, Coal & Coke Co., Middlesborough, Ky.

In 1901, "F. H." allied himself with the Fairmont Coal Co., Fairmont, W. Va., serving in the capacity of chief chemist. This was before the Fairmont people had perfected the great consolidation of companies that now exists and operates



FRANK HAAS

in four different states. The present big, fine building that houses the operating officials and engineering departments of the Consolidation Co., in Fairmont, had not been erected, and Mr. Haas' modest business abode was located in the basement of the old building. "Times do change," and he and his associates now are fixed so comfortably in their new headquarters, that a mere look at the elegance of their surroundings causes the average coal man to turn green with envy.

In 1905, Mr. Haas was made assistant general manager of the big corporation, then created and known as the Consolidation Coal Co. The new concern included not only the Fairmont mines, but also took in the biggest operations in the Georges Creek, Md., field, and mines located in the vicinity of Somerset, Penn. Recently the Consolidation company extended its sphere of activities into Kentucky, and within the next year, it is probable that this corporation will be producing more Kentucky coal than any other concern mining in that state.

In 1907, when there was a shift in the makeup of the official staff of the Consolidation company, Frank Haas was appointed consulting engineer, and since that time has actually been the head of the technical work of the company. A great part of his time during the past two years has been spent in the development of the new acreage in Kentucky.

The rapid rise of Mr. Haas to his present important position has been due almost entirely to his own earnest and efficient work. If, however, any one person had a hand in shaping his career and affording him needed opportunities, that person was the late Lee Malone, peer of mine managers, and one of the biggest, best men who ever engaged in mining coal. Mr. Malone started as a miner in the Fairmont field, and having only what education he gathered from the school of experience and hard knocks, he recognized in Mr. Haas the qualities and advantages he himself most lacked, and it is possible the "going" for Frank was made a bit smoother by Mr. Malone's early recognition of his unusual and valuable ability.

Frank Haas has not confined himself merely to the practical development and application of other people's ideas to his own work, but has made any number of original investigations along new lines. It is probable that the first work on coal calorimeters in this country was done by him, in association with the late Prof. N. W. Lord. In the matter of "High Humidity for Mine Ventilation," Mr. Haas is somewhat of a pioneer, and his ideas on this subject are based on actual practice at the mines under his control. He believes that the saturation of a mine atmosphere with steam is not for the purpose of furnishing the water for wetting the mine, but is done to prevent evaporation of water naturally in the workings. He says: "Theoretically, a place in a mine once thoroughly wetted and ventilated with a saturated atmosphere will remain wet indefinitely. This then is the condition which should be attained." He claims that in our shallow mines high humidity does not injure the men.

Concerning mine laws, "F. H." believes that all legislative measures should be short and concise and their enforcement rigid. Facts that are contained in volumes of matter are rarely discovered. He is also of the opinion that in our endeavors to supply the miner with plenty of air we have reached a point where the excess should be regulated. He believes over-ventilation is becoming a danger to the men.

During the past year, Mr. Haas has served as president of the West Virginia Coal Mining Institute, and the work of this body has increased in scope and efficiency under his régime.

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. ROB'T MCKEAN, Sec'y.
505 Pearl Street, New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin, N. W. 7.

FLOYD W. PARSONS, Editor.

Correspondence suitable for the columns of COAL AGE solicited and paid for. Name and address of correspondents must be given—not necessarily for publication.

Subscription price $3 per year in advance for 52 numbers to any post office in the United States or possessions, and Mexico. $4 to Canada. $5 to any other foreign country.

Subscribers in Great Britain, Europe and the British Colonies in the Eastern Hemisphere may send their subscriptions to the London office. Price 21 shillings.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday of week prior to date of issue.

Entered as second-class matter, October 14, 1911, at the post office at New York, New York, under the act of March 3, 1879.

Cable Address, "Coage," N. Y.

CIRCULATION STATEMENT

Of this issue of Coal Age, we will print 7600 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

Snap Judgment vs. Facts

The battle between truth and patriotism is still waging. Some value patriotism more than truth, some esteem truth more than patriotism, and then there are some who eschew both truth and patriotism and cover themselves with the *toga candida*, and seek office.

Under the government frank, bearing the eagle, laurel leaves and printing press of the Government Printing Office, circulates a little pamphlet in a paper cover entitled "A Federal Mining Commission, Address of John Randolph Haynes, M. D., Special Commissioner on Mine Accidents, State of California." It was read before the joint session of the American Economic Association and the Association for Labor Legislation at Washington, D. C., Dec. 30, 1911.

Dr. Haynes calls for our diatribes by stating that "some day we may come to regard fatalities which can be readily foreseen and so easily prevented as little better than murders." His remarks specifically refer to three-quarters of our fatalities, that being the number declared to be unnecessary. We by no means accept the statement that accidents can be reduced by prevision to one-fourth of their present frequency.

But even then, preventable, foreseeable accidents do not necessarily involve criminal carelessness and if they do, the charge will lie equally against miners and management. If the operator, who is unfortunate enough to lose a man by accidental death, is a murderer then by parity of reasoning, the man who is killed, as a result of lack of foresight is a dishonored suicide. To narrow our statement; most of the accidents are from roof falls. All such, if unnecessary, involve the contributory or sole negligence of the man killed.

Let it be remembered that the laws have been extremely stringent, compelling the operator to hire men to inspect the acts of the employee. It is severe and unjust to conclude that having gone to the full length of the legal requirements, and having moreover engaged rib bosses and timbermen for the workmen's further protection, the operator is still to receive the condemnation for all misadventures, both when the employee himself is alone blamable, and when the stigma, greater or smaller, cannot be rightly laid on anyone. Two deaths are said to have added to the glory of the Federal service, but if such deaths had occurred in the mining industry, there would have been some unpleasant insinuations at the inquiry. It would have been necessary to defend the training of the men, their apparatus and the quality of the oxygen supplied.

To prove his point, Mr. Haynes fairly wallows in statistics. He says: "From three to five thousand coal miners are annually killed outright in the United States." We cannot find that anyone of authority has ventured to give any such figures, and we think the estimates so far compiled are reasonably exact. True, authorities differ several hundred lives in a single year, but that is because some try to work with an exact calendar, and others mix the calendar year used by a state like Pennsylvania with the fiscal year of a state like Illinois.

The highest death rate, according to J. A. Holmes' computation, was 3127, and according to Frederick L. Hoffman, 2992. The latter statistician gives the average for the five years preceding 1910 as 2404. We do not know where J. R. Haynes got his data. Certainly not from high authority, though sometimes he follows such authority all too closely and flagrantly, by laying great stress on the death rate of 1907, when Monongah, Darr and Naomi swelled the number of dead inordinately.

He calmly compares the average rate of death in European countries with the black letter year in American annals. Every country has its years of evil import. England has the year of the "Hulton" disaster; France has that of Courrières, and it is not fair to balance years of misfortune in one country with the average years of another.

This special commissioner—special

forsooth, because no commissioner was really needed—has spent much time far over the mountains from his state. He could not learn much about mining at home because only about 0.003 per cent. of the coal mined in the United States would then be subject to his supervision. In fact, single mines without railroad facilities might easily be found mining 37 tons per day, which is as much coal as is extracted daily between San Diego and Crescent City.

He makes the statement that "of all American industries, mining is the most hazardous." This is perhaps true, in a manner, because nearly every person in that industry is exposed to its full hazard. About 70 per cent. of the mine workers labor underground, whereas in railroad work barely 20 per cent. of the workers are trainmen. Hence, a bare fifth of the men face the real hazards of railroading; the rest are more likely to die of nervous diseases, of diabetes, rheumatism and dyspepsia, than of an accident.

If, however, the coal workers as a body below and above ground are compared with the trainmen on the railroads of the United States, then the former have a distinct advantage, and even if underground coal workers alone are compared with trainmen, the latter have still a far larger death rate. In 1909 the death rate among trainmen was 4.87 per thousand, the year before it was 6.66, in 1907 it was 8 per thousand, and in the year preceding 8.07.

Mr. Haynes says that American conditions are safer than European. It may be so, but it will take a large amount of careful analysis to prove it. We are unwilling to accept it on his snap judgment. How much he may be relied on is shown by his statement that "up to the present time, Americans are not operating in the very deep levels of 4000 ft. or lower, not uncommon in Europe." A book published by no less a press than that of Cambridge, not more than a year ago, says: "In England we read that several collieries are 3000 ft. deep, and in Belgium two are nearly 4000 ft." How does this statement agree with that of Mr. Haynes?

It is well known that mines over 4000 ft. deep are regarded as doubtful problems for the future, and that the British Geological Survey has excluded deposits over 4000 ft. deep from its economic estimate of coal available. Many European mines are still less than 1000 ft. below the surface.

We know that this does not answer Mr. Haynes' comparison of home and alien mines, nor do we now desire to meet his statements in this editorial. But it may be permissible to say that experience in America has shown that where the greatest dangers are faced, the greatest death rate occurs. The anthracite regions and Colorado have distressingly high death rates, and yet these regions lead in preventive and corrective methods.

We doubt whether the eulogies of European countries are deserved. In 1909 in sixteen counties of Pennsylvania 1.45 lives were lost per thousand men employed. Looking over the list of "honor" we find counties recorded where safety is least considered, but where natural conditions assure the safety of the mines.

But Mr. Haynes has the Watteyne-Meissner-Desborough report to fall back on. The only report made by these three European experts to the United States makes none of the statements with which Mr. Haynes has credited them, and if it did, the case would not be proved. The casual observations of a stranger are interesting, naïve and oftentimes provoking, but they are rarely in all points just. The honorable commission did not, however, find in their report that American conditions were far better than in Belgium or France; they did not announce that an unbelievable state of carelessness, negligence and ignorance prevailed in the United States.

To show the dangers of snap judgments, we cite the fact that German mines have been badly infected by the hookworm. The German miner's span of life has been reduced thereby and his vitality impaired. In America the worm has not been a part of our disagreeable experience. Let it, therefore, be said that an unbelievable state of carelessness, negligence and ignorance prevails in the German Empire. We naturally hesitate to lay claims of this sort against Germany, or even Belgium, England, France or Hungary, though also infected.

Truth has the better of our ardent patriotism. Just as in those countries certain unfavorable hygienic conditions exist, not duplicated in American coal mines, so in our mines certain menaces to safety occur more markedly than in England. As a matter of fact, coal dust conditions in America are as different from those in Europe, as the mountain mine conditions in Colorado are different from those in the lower hill country mines of Pennsylvania. The roof risk is also a problem not altogether personal.

This active commissioner of labor has discovered that in 1869 there was a disaster at Avondale in Luzerne Co., Penn. "Many a miner since then has lost his life from the burning of wooden shaft structures erected since the Avondale disaster." We only recall the burning of the shaft timbers in one working mine of America since that time, and the fire did not start in the shaft but in the mine. We recall, however, that last year the Threslington colliery buildings, West Cornforth, England, burnt down and "lumps of burning timber" fell down both shafts, the "pithead being a mass of flames."

To return to our pamphlet, we are told by Mr. Haynes that the Briceville, Tenn., accident is one of many cases where a "second opening to the mine would have saved hundreds of lives." We cannot see how any more men could have been saved than were in the mine, nor even how more men could have been saved than were actually killed. We cannot understand how the commissioner can conclude there was but one opening when there were at least three. So here again the argument lags.

Mr. Haynes desires the formation of a Federal Commission of five members, three of whom are scientific men, selected for their special eminence in the subject of coal mining. Let it be duly noted that John Randolph Haynes cannot meet such onerous requirements. The voters should mark him well, and if his name is proposed, see that he be not appointed; for, to judge by his remarks, he could not pass a mine foreman's examination.

And lest some should think we are too severe, we quote some of the further gems of thought from this work: "In Europe a situation where a mine foreman could not read would not be understood. In America almost anybody is considered good enough to be a mine foreman." "The coal miner is prone by his occupation to tuberculosis and other diseases." And here, that we may not weary the Court, we rest our case.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

British Columbia Examinations for First Class Certificates — Ventilation

Ques.—Describe one system of ventilation and general management you would adopt in a gaseous mine in order to keep the mine in a safe condition, both as to explosion and other causes.

Ans.—To avoid as far as possible the ignition of gas by the drivers' lamps, the main haulage road should be made the intake air course for the mine. To do this and to avoid the necessity of doors on the main haulage roads, the mine must be ventilated on the exhaust system. The general plan of the mine and the arrangement of the main entries will depend largely on the size of the proposition. The main roads should be driven on the double- or the triple-entry system, preferably the latter. In the triple-entry system the middle entry is the intake and haulage road, the two flank entries should be the return air courses for their respective sides of the mine. The mine should be equipped with a good type of centrifugal fan so arranged that the air current in the mine can be reversed in case of need. The fan should be set back a short distance from the top of the air shaft and explosion doors provided to prevent, as far as possible, the destruction of the fan in case of an explosion occurring in the mine. All doors and other equipments at the shaft bottom and elsewhere in the mine should be constructed of incombustible material. Double doors should be used at all main points in the air courses, and emergency doors should be provided wherever the short circuiting of the air, in case of an explosion destroying the doors, would cut off the escape of the men. As far as practicable, these emergency doors should be so arranged as to close automatically in the event of an explosion. A strict discipline should be maintained throughout the mine in regard to the use of lamps, oils, powder and other material.

Ques.—Describe the principle on which a mine fan operates and does its work. How should the outlet to an exhaust fan be arranged so as to allow the air from the mine to be discharged freely? The area of the discharge opening of a fan is 5 ft. by 5 ft. and the quantity of air passing through the fan 50,000 cu.ft. per min.; what theoretical effect will be produced by building on this opening a chimney that will gradually expand until the dimension of the discharge will be 10 ft. by 10 ft.?

Ans.—With respect to their principle of operation there are two types of mine fans: (1) The disk fan, which acts by propelling the air by means of the rotation of its inclined blades. The principle is the reverse of that of the propeller of a ship. The rotation of the propeller drives the ship forward, owing to the resistance of the water. The rotation of the disk fan drives the air forward, the fan remaining in place.

(2) The centrifugal fan acts on a different principle from that just described. The rotation of this fan develops a certain centrifugal force determined by the weight of air revolved in the fan and the velocity of its rotation. The centrifugal force developed is exerted radially outward, causing the air to flow from the center toward the circumference of the fan. The air enters the center of the fan and is discharged at its circumference.

The action of the fan creates a difference of pressure between the intake and discharge openings. The amount of this pressure, however, is determined by the resistance of the mine. Cut out or reduce the mine resistance and the pressure falls. The greater the pressure established by the mine or the greater the mine resistance the less the quantity of air circulated by the same power.

(b) The area of the discharge opening, 5x5 ft., is 25 sq.ft., which for a volume of air of 50,000 cu.ft. per min. gives a velocity of $50{,}000 \div 25 = 2000$ ft. per min. The theoretical effect produced by enlarging the area of discharge by building an expanding chimney, so that the area at the point of discharge will be $10 \times 10 = 100$ sq.ft., will be to reduce the velocity of discharge in the same ratio in which the area is increased, making it $\frac{1}{4}$ of the original velocity, or in this case 500 ft. per min. The head due to the velocity of discharge varies as the square of the velocity. In this case, therefore, the theoretical effect is to reduce the head due to the velocity of discharge, or to reduce the loss of head, in the ratio $(\frac{1}{4})^2 = \frac{1}{16}$. In other words, the loss of head due to the velocity of discharge is $\frac{1}{16}$ of what it was before the chimney was built.

Ques.—How will a current of 100,000 cu.ft. per min., passing in the main airway of a mine, divide between the following three splits?

Split A, 6 ft. x 6 ft., 2000 ft. long.
Split B, 6 ft. x 6 ft., 4000 ft. long
Split C, 6 ft. x 6 ft., 6000 ft. long.

Find the quantity of air that will pass in each split, supposing the pressure on all the splits to be the same.*

Ans.—Since all the splits have the same cross-section; namely, 6 ft. x 6 ft., the area and the perimeter, in each split, are the same; and, for the same pressure per sq.ft. at the mouth of each split, the quantity of air in circulation is inversely proportional to the square root of the length of the split. It is necessary, first, to find the value of the split potential, in each case, which becomes here, the area and perimeter being constant $\frac{1}{\sqrt{l}}$. In this method, the work is much simplified by reducing the lengths, 2000, 4000, 6000 to the lower related values 2, 4, 6, and substituting these for l in the above expression; thus,

Split A,

$$\frac{1}{\sqrt{l}} = \frac{1}{\sqrt{2}} = 0.707$$

Split B,

$$\frac{1}{\sqrt{l}} = \frac{1}{\sqrt{4}} = 0.500$$

Split C,

$$\frac{1}{\sqrt{l}} = \frac{1}{\sqrt{6}} = 0.408$$

Total 1.615

Since the quantity of air passing in each split is proportional to the split potential, the several quantities of air passing are found for each split; thus,

Split A,

$$\frac{0.707}{1.615} \times 100{,}000 = 43{,}777 \text{ cu.ft. per min.}$$

Split B,

$$\frac{0.500}{1.615} \times 100{,}000 = 30{,}960 \text{ cu.ft. per min.}$$

Split C,

$$\frac{0.408}{1.615} \times 100{,}000 = 25{,}263 \text{ cu.ft. per min.}$$

Total 100,000

*Note—The reading in the above question has been slightly changed from the original so as to make the statement of the question harmonious. The original question states, "the current (100,000 cu.ft.) passes through an airway 6x5 ft., 10,000 ft. long, which is divided into three splits," giving the splits as above. This statement is at variance with itself. Since the areas of the airways in all the splits is 6x6 ft. and the total length of the splits is 12,000 ft. instead of 10,000 ft.—Editor.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Booster and Tandem Fans

Letter No. 1—Concerning the discussion of the use of a "booster" fan to assist the regular fan, in the ventilation of a mine; and the use of "tandem" fans, or two fans operating on the same air current, the one blowing and the other exhausting, I am glad to offer the following remarks:

The so called "booster" fan will, undoubtedly, often permit the working of places where the air would otherwise be insufficient for the requirements, owing to leaky doors, stoppings, etc. We know that all mine ventilation depends on the principle that the moving force or the force creating ventilation is the difference between two pressures namely, the pressures on the air at the intake and return openings, respectively. With the same pressure at both ends of an airway, no current will be created.

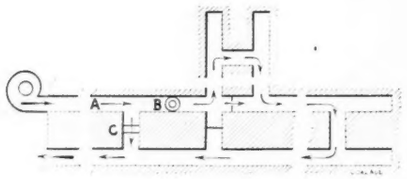


FIG. 1. SHOWING LOCATION OF "BOOSTER" TO OVERCOME EFFECT OF LEAKY STOPPING ETC.

It is this condition that gives rise to bad-air periods, in mines dependent on natural ventilation alone. This condition occurs frequently in the spring and fall seasons, when the outside and inside temperatures are alike. The same condition may also occur in the inner sections of a mine, owing to the leakage of air through poorly constructed stoppings and doors. When this is the case, there is practically no circulation of air in that section of the mine, which is thus cut off from the main air current.

To overcome this difficulty, it is common to install a "booster" fan within the mine, at the mouth of the affected section. This booster fan at once, by its action, creates a difference of pressure, increasing the pressure on the intake of the section over that on the return. The installation of this "booster" does not materially affect the total quantity of air entering or leaving the mine; but overcomes the tendency of the air to pass through the leaky stoppings and doors by creating a depression in that portion of the airway and throwing the air forward into the inner section of the mine.

I have indicated, in a brief way, in the accompanying sketch (Fig. 1), the location of the "booster" fan *B*, with respect to the pitch headings adjacent where the circulation of air was deficient. At the point marked *A*, within the mine, the effective pressure of the principal fan is *nil*. The last bit of air is leaking through the brattice marked *C*. The "booster" fan installed at *B* is very effective in forcing air to the face of the pitch headings. It is under these conditions that the so called "booster" will assist, so to speak, the principal fan and permit men to work in places where they could not work previously, owing to the foul air.

The advocate of the "booster" fan was, therefore, right when he said "It would permit him to work his men in places where he could not work them without this fan." The other superintendent was, also, perfectly justified in saying that the second fan erected over the upcast shaft to assist the blowing fan at the downcast shaft would not "draw." Naturally, the second fan acted as an impediment or obstruction to the air current and decreased the efficiency of the first fan, since the air current created by the first fan must pass through the second, which offers a certain resistance to its passage. This resistance of the second fan to the passage of air is due to the friction of the air against its surfaces and the deflection it meets in passing through the fan. Two fans will always offer twice the resistance of one fan to the same air current.

THE ACTION OF TWIN FANS

In Figs. 2, I have shown two arrangements employing two fans in each. In the first arrangement, Fig. 2, (*a*), the fans are arranged in tandem, the one blowing and the other exhausting. The blowing fan is placed at the intake opening of the mine and the exhaust fan at the discharge opening. In this case, all of the air created by the first fan must pass through the second. In the second arrangement (*b*), both fans are placed either at the intake or the discharge opening of the mine. The fans work side by side, each taking its own portion of air. In this case, it is often supposed that the two fans will produce twice the quantity of air that would be produced in the same airway by one fan working alone; but this is not the case.

The operation of the two fans will necessitate an increase of power and produce also an increase in the circulation. If no change is made in the course of the air through the mine, any desired increase of quantity will require an increase of power in proportion to the cube of the ratio in which it is required to increase the quantity. Thus, to double the quantity will require eight times the power. Two fans operated side by side would produce, assuming the power on the air was doubled, an increase of quantity in proportion to the cube root of 2. Thus, $\sqrt[3]{2} = 1.26$. If each of these fans, working alone, would produce a current of 20,000 cu.ft. per min. in this airway; when working together, they would produce $20{,}000 \times 1.26 = 25{,}200$ cu.ft. per min. It is important to remember, however, that since one-half of this volume of air is passing through each fan, the

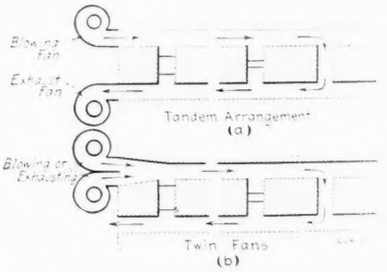


FIG. 2. SHOWING RIGHT (A) AND WRONG (B) WAYS OF INSTALLING TWO FANS ON A SINGLE CURRENT

work lost in each fan will be proportionately less; and, as a result, the two fans will produce a slightly larger quantity of air than that above named. In other words, the circulation with two fans running side by side will have a higher efficiency than can be realized in the operation of a single fan capable of producing the same quantity of air.

R. Z. VIRGIN.

Johnstown, Penn.

Letter No. 2—Referring to the question in regard to the practicability of installing a "booster" fan to assist the main fan; contained in your Foreword of May 25, I wish to say that "booster" fans are of advantage in mines where the air travel is very long, where air courses are of insufficient size to keep down the water gage, or where the coal pitches. I can think of no disadvantage due to the use of "booster" fans under any circumstances. In all instances they will prevent loss of air by leakage due to great pressure where only one fan is

used. The principal expense is the cost of the fan itself and the power for running it, which generally is electricity, which means the carrying of power for a long distance with the cost of copper and transmission losses.

CARL SCHOLZ.
Vice-Pres. and Gen. Mgr.
Consolidated Indiana Coal Co.,
Chicago, Ill.

Letter No. 3—"Is a booster or tandem fan practical, and will it increase the quantity of air, when both are operating on the same air current?" I say, yes; it is practical and will increase the volume of air in proporion to the size and speed of the second fan.

The Consolidated Indiana Coal Co., at its No. 25 mine, located in Sullivan County, Ind., installed a 6-ft. booster, electric-driven fan, in the intake airway, on one side of the mine, 1000 ft. from the foot of the downcast shaft. At the top of this shaft there is a 12-ft. steam-driven Crawford-McCrimmon fan, running about 115 r.p.m. With the latter fan running alone, the ventilation on this side of the mine was poor and not sufficient for the number of employees in that section. Something had to be done and it was decided to install the booster.

This booster is a disk fan, similar in construction to the Stine disk fan; and is geared to a mining-machine motor. The fan is running at 350 r.p.m., and since it has been in operation the quantity of air in that air course is increased nearly threefold, as shown by measuring the air before and after the installation was made. These facts can be verified by anyone who desires to come and measure the air when the fan is not running and, again, when it is running. The booster only runs during working hours, and when first installed was run at 550 r.p.m. This speed, however, had to be reduced as the booster took too much current to drive it, and at that speed made air enough to blow open the mine doors on the inside, which were hung so as to open both ways. If we give mine ventilation any study, and reason for a minute we will see the practicability of a booster fan when properly arranged.

In passing air through the air courses of any mine, friction must be overcome; and as the air courses increase in length or contract in area the quantity of air decreases unless the speed of the fan can be raised so as to keep pace with the increase of friction, which is not always practicable. But, when the fan has reached its limit, if we place another fan on the same air current, either midway in the air course or at the outlet, it will have the same effect as if we cut the length of the airway in two. Let us not make the mistake, however, that some have made, by placing two fans on the top of the same air shaft, and expect results, for the fans so arranged, will often work against each other, and the ventilation will become worse than before the erection of the second fan.

Shelburn, Ind. R. J. PICKETT.

Letter No. 4—As to whether it is possible to run a "booster" fan to assist another fan to ventilate a mine, will say: If a blowing fan is forcing the air into a mine, but, on account of leaky doors and stoppings, a part of the inner workings or a certain section of the mine is not getting sufficient air, the intake entry of this section being, as we say, "dead," there is no doubt but that a "booster" can be installed at this point, which would take off enough air from the main air current and circulate the same through this section and back to the main current. The "booster" fan would thus assist the main fan to properly ventilate the mine, providing, however, the main fan is producing a sufficient volume of air for the entire mine.

I am inclined, also, to believe that when the main fan, working on a continuous current, there being no air splits, does not produce sufficient air for the mine, a "booster" fan, installed near the head of the mine within the workings, would greatly assist the circulation of the air. This condition will often occur in the development of a mine, the mine resistance becoming too great for the power of the fan, owing to the increase of friction and pressure. When the main fan, on this account, fails to produce the necessary velocity in the workings, it seems to me that a "booster" at the head of the mine, if of sufficient capacity, will pick up the air delivered to it by the main fan and drive it out of the mine.

But, as for running two fans tandem, that is to say, one at the top of the downcast shaft, forcing the air into the mine, and the other at the top of the upcast shaft, exhausting the air from the mine, I do not believe this plan would improve the ventilation of the mine, for the following reasons:

(1) If there were leaky stoppings, cutting the air off from some section of the mine, the exhaust fan would only pull the air through the leaky stoppings into the return current, and still leave the unventilated section of the mine in the same condition as before.

(2) Again, in case all of the stoppings are in good condition, it does not seem to me that tandem fans would even then increase the volume of air in circulation, because, the forcing fan can only produce a given volume of air, and the exhaust fan cannot get any more air than the first fan delivers. In this case, therefore, it seems to me that both fans would be working on the same volume of air that one of these fans could produce alone. I do not claim to be familiar with this subject wholly, but these are my ideas, and I shall watch this discussion, by others, with much pleasure.

Gatliff, Ky. J. C. BABB.

Letter No. 5—Replying to the Foreword, COAL AGE, May 25, in which you ask for a full and free discussion as to the possibility of operating a "booster" fan to assist the principal fan in ventilating a mine, I beg to advise that, in my opinion, it is possible. This opinion is supported by the fact that I have done this very thing. I do not, however, believe it to be good mining practice. Lack of money to purchase a more efficient fan was the chief reason, in this case, for the installation of the "booster."

I consider the "booster" a "make shift," its use in most cases being forced on the operator by lack of money or time to procure a better facility.

It is unnecessary to say that there should be no leaky stoppings; or the air courses should not be cheked by falls and other obstructions in the airways. It is, however, easier to say this than to do it; or to remedy the trouble from leaky stoppings. This is especially true in a mine giving off little or no gas.

When a coal company is managed by a man who has had no experience in mining but whose experience lies in dividend getting in other lines of business, the ventilation of the mine is apt to be regarded as an unnecessary expense. It takes a strong showing to convince such a one of the benefits to be derived from the expenditure of a sum sufficient to install a ventilating apparatus having the proper efficiency. Hence the installation of the "booster" or some other make shift.

I know of other cases than my own where "boosters" have been installed; and there seems to be no doubt as to the possibility of getting some results thereby; but there is some doubt as to the practicability of adopting this plan. Unless forced to do so by circumstances as first related, I would not install a "booster."

G. M. SHOEMAKER, MANAGER,
THE VIRGINIA-LEE COMPANY, INC.
Pennington Gap, Va.

[Further discussion relative to the use of "Booster" fans will be printed next week. All readers are invited to contribute.—EDITOR.]

Young Mine Foremen

On reading the article of Sim and W. H. Reynolds, in the issue of May 25, on "The Dangers of the Pittsburgh Coal," I was most forcibly struck by the keen language which so ably delineated the old man's attitude at the Pittsburgh demonstration. Shakespeare's Shylock is no more in evidence in my mind than is Reynolds' old-time mine boss.

In the presentation they have given us, we see the embodiment of ignorance,

doubt and denial. The old man's mien, his language, the envelope and the dust he holds in his shaking hand, all bring him vividly before us. We can watch him as he notes that the scientific know-alls failed to blow the mine up. Finally the deed is done, and the workings of the old man's brain are not depicted by Brother Reynolds, but he says enough when he records the fact, "that the old mine boss changed his opinion."

We are all heartily glad to hear that he did so, and it is one of the desired ends of such meetings that such men should be convinced. If fossils like the one described can be brought to light by such Sinaitic thunderings, then there is hope that the masses may fully realize the tremendous fact that dust will explode.

But this was not the passage in the article which took away my breath. I do not believe that the writer intended a "solar plexus" blow to us old men, but such a construction could well be put on the passage which follows and loose inferences could be drawn from what is said. Some might conclude that most old men belong to the same school, what old school is not designated, and by parity of reasoning it might be concluded that younger men belong to quite a different school. To give the quotation: "As he ambled about, he convinced us that there still existed, if not among the younger men, at least among many of the old school of mine officials, who are equally charged by the state with the care of many human lives, such a narrowness of mind and viewpoint, as is apt at some time or another to be the cause of a disaster." Now, I must confess I cannot grasp the distinction between the schools, as far as age limits are concerned, nor as far as my observations extend. Of course, I take mining life to be a great school. In fact all life itself is only a school, and a man with an open, progressive mind, watching events, learning facts, and keeping in touch with the spirit of the age is always young to me. The spirit never grows old. And I have seen, and so have you, and so has Brother Reynolds, sulky, dull, pig-headed and very dogmatic young men and very progressive so called old men. In fact, youth is generally a period when "they know it all." There comes a time when one does not know too much, and then again —well—we mumble out something like this: "There are more things in heaven and earth than are dreamt of in our philosophy."

In closing I would say, keep the dust and gas out of your mine, keep your mine damp and your air moist and use the best tested explosives, never failing to keep up with this age of ideas and then human suffering and loss of life, if not eliminated, will be brought down to a figure worthy of our united efforts.

Eccles, W. Va. GEORGE SCOTT.

A Cave-in Proposition

I have read with interest Mr. Sutton's proposition for dealing with a cave, published in COAL AGE, May 18, p. 1050. There is no doubt that Mr. Sutton's method would give good results, under certain conditions I would suggest, however, modifying his method whenever the rooms are connected by cut-throughs. The chief objection to Mr. Sutton's method is the number of curtains required on the entry or haulage road. As the life of curtains is necessarily short when all the coal from a heading must be hauled through them, their use on a haulage road should be avoided, as far as possible.

I submit herewith a diagram (Fig. 1) of the plan I would adopt in the present case. This figure shows the brattices carried up from the last cut-through to

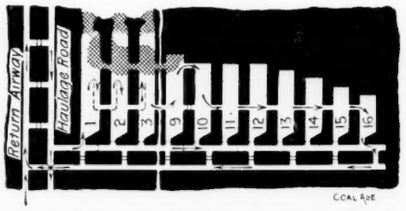


FIG. 1. SHOWING ARRANGEMENT OF BRATTICES TO VENTILATE CAVED ROOMS

the edge of the fall at the face of each room. A curtain is then placed on the heading between rooms 1 and 2, and another curtain on the heading between rooms 9 and 10; a curtain is also hung in the mouth of each intervening room. As shown in the sketch, the brattice is attached to the outby rib of the cut-through, in each case; and, except in room 1, they are erected on the straight-rib side of the room, so that the fresh air travels behind the brattice. Care should be taken that the area behind the brattice is sufficient to conduct an ample volume of air without increasing too much the velocity of the current and the mine resistance. Since the fall has not closed the second cut-through between rooms 9 and 10, a stopping is shown placed in the first cut-through between these rooms, to deflect the air to the face of the room.

Johnstown, Penn. BENJ. HARTILL.

Haynes and Briceville

In regard to the statement of John Randolph Haynes, in his address to the American Economic Association, Dec. 30, 1911, we beg to advise that we have three openings at our Cross Mountain mines, all of which are or can be used as traveling ways. The mine law of the state of Tennessee requires two openings not closer than 150 ft. apart, and we more than complied with that requirement. I might also add that our air shaft which is located 3100 ft. from the mouth of our mine can be used as an outlet, and had there been any men alive in our mines in that vicinity, they could have been rescued.

I may also state that within 30 minutes after the explosion, we had men at the bottom of the air shaft, these men having traveled 3000 ft. along the main entry. When the men reached the bottom of the shaft, we had ropes let down from above by which supplies were furnished so that we could commence to build brattices where needed.

I might say in connection with the comments made by John Randolph Haynes, that we have 2500 ft. of cover over our mine and other companies have leases on either side of our workings. Consequently openings could not be arranged close up to the working places of the mine. However, the following exits were available for travel: The main opening, the haulage road and a manhole. If necessary we could have removed men by the air shaft of which mention has been made above.

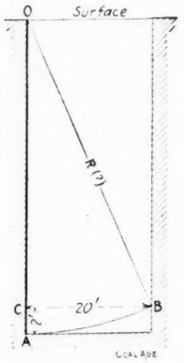
T. I. STEVENSON,
President, Knoxville Iron Co.
Knoxville, Tenn.

A Shaft Problem

(Another Solution)

The problem, to find the depth of the shaft, given in COAL AGE, May 25, p. 1086, can be solved by algebra very simply, as follows:

Referring to the figure, in the right triangle OBC, let $OB = x$ (depth of shaft), then $OC = x - 2$, and $BC = 20$ ft.



SHOWING CROSS-SECTION OF SHAFT

But, the triangle OBC being right angled at C,

$$(OB)^2 = (OC)^2 + (BC)^2$$

Or, substituting the values given above,

$$x^2 = (x - 2)^2 + 20^2$$

$$x^2 = x^2 - 4x + 4 + 400$$

Transposing and reducing,

$$4x = 404$$

$$x = 101 \text{ ft.}$$

JOHN T. FULLER,
Consulting Engineer.
Honesdale, Penn.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Law Breaking and Mine Discipline

By Sim Reynolds* and W. H. Reynolds

To many men, officials as well as miners, certain provisions of our present laws seem unnecessarily strenuous and uncalled for. These men fail to realize the positive necessity for laws applying equally to all men and all mines. They cannot or will not make distinctions themselves, yet they would have the mining code do so. Witness, for instance, the stir some time ago, created by the attempted application on the part of the Pennsylvania Department of Mines for a wise and necessary act regulating shot-firing and the use of tested powders. The attempt to carry this act into execution for the benefit of a certain class of miners met with a stubborn resistance of the very men, one would naturally have expected to welcome it. The fact that the department's desire to safeguard the lives of these thousands of men seemed likely to take a few pennies from the pay of the men to be benefited, caused a strike which need not be dilated upon, since every reader of this journal is doubtless familiar with the matter. When the men themselves prove unwilling to pay a few cents a day to remove only one of several elements of extreme danger, should we wonder if we find employers indifferent?

The miners of the Pittsburg district were self-blinded to the fact that to be of any service a regulation of that sort must of necessity cover the entire field wherever need of such legislative action existed, that if A's mine was fortunately such that wholly or in part it could operate safely without this safeguard, yet to make a distinction in favor of A's men would obviously call for the same favor elsewhere, and with real or imaginary changing of cause and effect between one mine and another, the whole structure built for the safety of the region would sooner or later topple on the heads of those who made it.

The Laws Cannot Be Framed for Every Individual Circumstance

It seems not to occur to some men that there are few laws—be they framed for the betterment of social, business or industrial conditions—which do not inevitably work hardship at some point or other. Even the imprisonment of a criminal makes others beside himself suffer. These hardships in the enforcement of laws will always exist, so long as no two mines have characteristics exactly alike. Some little that is bad will have to be endured for the greater good which is conferred.

The best that can be done for imperfect human beings is to endeavor to give the greatest possible measure of good to the greatest possible number. Yet, failing to fully realize this philosophy, men singly and collectively set about breaking these laws by fitting them to their individual needs and circumstances. And it is because of this fact that we need more and still more education along our own lines. It is this attitude which calls into being stringent laws, and gives us an inflexible determination to enforce discipline and carry out what laws we have.

Everybody Does His Part to Make the Mines Unsafe

Nor is the miner alone in this respect. At this moment there come flooding upon our memories a full score of cases which take in every one connected with the industry. The careless trapper boy leaves a door but partly shut, trusting or pretending to trust to the backward kick he gives at it as he swings onto the tail end of an ingoing or outbound trip. Perhaps he gets back an hour later to shut it if someone hasn't happened to go through ahead of him. Thus the ventilation of a gaseous section is left to the operation of an uncertain chance.

There is the manager, who, at some time or other, breaks every section of the code, as each in turn stands between him and a constant and large output, and the corps of engineers which enters an abandoned part of a gaseous mine which has not been previously examined for gas. The imputation of carelessness covers them all, and if death happen to pass over the first offense, they will be found doing the same thing over again just as did an offender who recently came under our notice.

Experience Does Not Teach

This latter instance resulted in our bringing up for punishment an old man, who ought to have known better than to be caught with smoking materials and matches on his person in a mine where such luxuries were strictly forbidden during working hours. The same man had, but a short time before, been removed from a mine which had like characteristics to the one he was entering, and which had blown up and killed every living being in it except himself. When he was asked regarding his carelessness, he replied simply that he "didn't think there was any danger." Another miner who worked beside us in a mine in northwestern Pennsylvania thought the same regarding his powder keg. He would persist in opening the steel canister by some method other than the sane way, which consists in removing the cap, but one day the steel pick point went in among the black grains with a few friction-engendered sparks, and Paddy left his wife and "childer" to hustle thereafter for themselves. Still another miner we knew, when removing old lamp wicks to put in new ones, had fostered the habit of placing them on the edge of his powder keg, instead of on a flat rock, many of which lay near by. In the end this man also left his family to the tender mercies of a far from tender world, because a lamp wick, obviously being slippery with grease, slipped into the "kagg."

Discipline Is for the Other Fellow

But, "lest we forget," we must ever keep in mind the fact that these men of lowly station, who "tak a whiff" when the bosses aren't near, or, like those mentioned, deliberately disobey the law with regard to the handling of powder, are not one whit worse, nor more deserving of severe punishment than the foreman or manager of a dusty mine who persists in ignoring the dangers of dust alone, and who in a spirit of narrowmindedness professes to hold nothing but contempt for the men, governmental or local, who would have them acknowledge that the innocent-looking coal dust is an element of great danger.

*Pittsburg-Buffalo Coal Co., Marianna, Penn.

Safety Warnings

On the statements given to the miners at the Pine Hill Colliery, near Minersville, Schulykill County, Penn., safety warnings have been printed. These lay stress on the fact that men are frequently killed, because the prudent men are afraid to "butt in" and warn the imprudent of the dangers to which they are exposing themselves. The mine foreman is not the only man who should have safety in his mind. If everybody warned his neighbor of the imprudence of tempting death, there would be less loss of life. The practice of the Pine Hill authorities is commended as likely to do much good.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Interstate Commerce Commission has rendered its opinion in regard to the investigation and suspension of advances in rates by carriers for the transportation of soft coal from Illinois mines to stations on the St. Louis & Hannibal Ry. It now fixes through rates and joint through rates for the transportation of the coal over the road in question to Missouri points. The Commission says in part:

Formerly the joint through rate from Panama to Hannibal, taking the latter as a typical point of destination, was 75c. a ton. Under the tariff of joint rates, which it is now proposed to cancel, the rate between those points is 82c. a ton. If this rate is withdrawn there will be available to shippers only the combination of local rates under which it is clear the traffic could not move. This result apparently was contemplated by the St. Louis & Hannibal in withdrawing its concurrence in the joint rates. As the withdrawal of the through rates, leaving in operation the lowest combination of local rates, would increase the charges on coal moving over that route, the defendants were under the burden of justifying their course and of showing that the resulting charges would be just and reasonable. But the record made at the hearing does not meet this requirement. In fact no effort was made to show that the combination of locals would be a reasonable charge on this traffic, nor was any substantial reason given for the cancellation of the joint through rates. We therefore find that rates in excess of those now in effect would be unjust and unreasonable.

Bureau of Mines Bill

After a lengthy debate on the Bureau of Mines bill offered by Representative Tooker on Wednesday May 29, the House of Representatives finally laid the measure on the table without passing it. The understanding is that the bill will be shortly taken up again and will then be passed. It is undoubtedly true that the opposition encountered by the bill is due to a fear that the measure would largely broaden the scope of the bureau's activity, and enable it to engage in mining operations on the public lands. Section 2 of the bill, which excited the greatest opposition and difficulty has, however, now been disposed of.

In advocating the measure, Representative Palmer of Pennsylvania probably expressed as well as any who spoke during the debate, the views of the advocates of the measure. Mr. Palmer said in part: "I want to say that so far as my observation has gone, and so far as I have learned from the people interested in coal mining especially, the work of this bureau, under the efficient and able management of its chief, Dr Holmes, has fully justified its creation. And although the time of its operation has been comparatively short, the work which it has done has fully come up to the expectations of those who devised the plan that resulted in the creation of this bureau. But, there are, as I intimated, other mining industries besides the coal-mining industry which are in need of the kind of service that this bureau has been giving in the coal-mining regions, and the present bill, as I understand it, is intended, in the creation of a new organic act for this bureau, to widen its jurisdiction and enlarge the scope of its work in order to include metal mining and quarrying."

Representative Fitzgerald took quite a different point of view, saying in part:

Some three or four years ago the Frick Coal Co., of Pittsburgh, conducted a number of very important investigations to determine a number of matters of vital interest to the company in the conduct of its operations. It does so no longer. It permits the Bureau of Mines, at the expense of the Federal Treasury, to relieve it of the burden which formerly belonged to it.

The primary object of the Bureau of Mines, one which should be kept in mind and from which we should not permit it to be diverted, is the protection of the men engaged in the mining industry, and by investigations to determine the causes of mine accidents, to outline methods by which accidents can be prevented, not only by the use of explosives that will not be hazardous to handle, but in proper shoring and working in the mines. But to investigate the economic conditions of these industries is to go much further.

The prospect now is that the Bureau of Mines bill will be passed in very much the form in which it was originally reported by the committee after amendment subsequent to its introduction.

Alabama

Birmingham—At a meeting of the preferred and common stockholders of the Alabama Consolidated Coal & Iron Co., held in Baltimore, May 31, announcement was made by Joseph H. Hoadley, former president of the company, but now chairman of the corporation, that Charles M. Schwab, president of the Bethlehem Steel Co., had promised to become financially interested in the Alabama Consolidated and to reorganize the company, provided the merger with the Southern Iron & Steel Co. should not go through. Facts also developed at the meeting which tend to prove that the efforts of the committee appointed about a year ago to merge the Alabama Consolidated Coal & Iron Co. and the Southern Iron & Steel Co. have proved fruitless, and the entire plan will likely be dropped.

Illinois

Mount Vernon—Prospectors working south of Mount Vernon have struck a 7-ft. seam of coal at a depth of 500 ft. A test has shown the coal to be of superior quality and it is understood that the field will be developed before long.

Chicago—Coal shippers along the Illinois Central lines as far south as New Orleans have protested against the new car apportionment plan put into effect by the railroad. This plan gages the supply of cars by the amount supplied by the road during the previous year. While the shippers claim that the new plan is radical and unjust the railroad officials declare that it was put into effect only after it had been found to be the most favorable to all.

Mt. Carmel—The Harrisburg mines, some of which have resumed operations since the recent shut-down, are reported to be shipping at the rate of 125 cars per day, and it is expected that this amount will be doubled in a very short time. This will be far short of a full output, but it is not anticipated that the business will be large until next fall.

Springfield—A recent meeting of the traffic managers of various railroads entering Springfield is expected to result in a reduction of 7 per cent in the freight rates to Eastern points. An urgent need of the coal men is an equitable rate to Chicago, it being claimed that Springfield is at a disadvantage of from 10c. to 20c. a ton as compared with points in Indiana. Relief in this latter particular, however, is not expected to be taken up until next month.

Bloomington—The first of a series of 52 damage suits against the St. Paul Coal Co. by widows and children of miners who lost their lives in the Cherry mine disaster of 1910 is being tried in the Bureau County circuit court. The aggregate of damages to be demanded is $400,000. The first case is that of Miles McFadden. This will be the test case, and it is estimated that it will require six weeks to complete it. The fate of the others probably will rest on the outcome of the McFadden suit.

Indiana

Terre Haute—The referendum vote taken recently by district No. 11, United Mine Workers, favored the acceptance of the proposed wage-scale contract by a substantial majority. The issue was in considerable doubt as there was evident a strong sentiment in favor of holding out for a weekly pay. The new contract provides for a semi-monthly pay, such as has been in force heretofore, and unofficial returns show that the vote stood 8007 in favor of accepting this provision and returning to work as against 3553 opposed to its acceptance. The new contract was signed May 31, and it was arranged that the men would return to work Monday, June 3.

Brazil—An effort is being made to organize the men employed at the stripping operations in this vicinity. A local union was recently established for two pits in the vicinity of Patricksburg and has become allied with the United Mine Workers.

Iowa

Des Moines—The mine workers of District No. 13 have ratified the agreement proposed at the recent joint conference of miners and operators. Despite the fact that the miner's convention declined to endorse the agreement, the referendum vote disclosed a large majority in favor of its acceptance. The mines are resuming work.

Kentucky

Maysville—The business of the Big Hill Coal Co. has been placed in the hands of John C. Chenault of Richmond, Kentucky, as receiver. The receivership is the result of a suit brought by John H. Jones to inforce mortgage claims against the property of the company in Lee and Bell counties. The suit is for $87,300. A restraining order was asked to prevent the State Bank and Trust Co., trustee; the New Straight Creek Coal Co., the Louisville and Atlantic Coal Co. and others from taking possession of the property.

Louisville—The newly organized Dean Coal Co., of Barbourville, has purchased the holdings of the Gibson-Carr Co., in the Brush Creek district of Knox County. The purchase includes over 1060 acres of coal lands and a recently installed mining plant. The company will begin operations at once.

The Interstate Coal Co., which recently purchased the holdings of the Cumberland Coal Co., now has investments of more than $1,000,000 in Knox county coal fields. Recently the company took over the holdings of the Bennett Coal Co. in the Brush Creek district, and it now owns all the mining operations in the Brush Creek field with two exceptions. Some time ago the Interstate Coal Co. purchased the Lunsford-Lawson-Detherage interests for $100,000.

Providence—A sale of the Fairmont Coal Mining Co.'s property was held here recently to dispose of the assets of the company which is in bankruptcy. The receiver rejected the bids which were offered on the ground that they were too low, and a private sale will probably be held instead.

Michigan

Bay City—An announcement was made, May 23, that the Michigan United Mine Workers and the operators had settled their differences and that the miners would return to work within a week.

Missouri

Kansas City—Coal operators and miners of the Southwestern district, after holding conferences in Kansas City for the last 60 days, have reached an agreement and a contract covering a period of two years has been signed. The agreement provides for a slight increase in wages. Miners and operators throughout Missouri, Kansas, Oklahoma and Texas are affected. The signing of the contract means that there will be no suspension in the coal fields of District No. 21 for two years unless something unforeseen develops. Had the agreement remained unsigned after May 31, a suspension would have followed. The contract expired Apr. 1 but provided for 60 days additional for negotiations.

Ohio

St. Clairsville—Fully 1300 miners were recently on strike in Belmont County. Six hundred men, employed by the Provident Coal Co., were out on account of trouble over a check-weighman; 450 at the mines of the Troll Coal Co. were out because they believed a member of the union was unjustly discharged, and at the Moore's Run mine of the Hutchinson Coal Co., at Bridgeport, 250 men were striking because they desired to ride to and from work on the motor trips.

The 600 men employed at the Provident mine, returned to work, June 3, as the company agreed to permit the employee selected by the men to go on the tipple. Three checkweighmen put on the tipple inside of three weeks by the company have been scared out of town by red flags and warnings that they would be killed.

Columbus—The U. S. Supreme Court, on May 27, reversed the Ohio railway commission and sustained the Wheeling & Lake Erie Ry. Co., in protesting against the establishing by the commission of a rate of 70c. a ton on what is called "lake cargo" coal, transported from the eastern Ohio coal field to Cleveland, Lorain and Huron. In sustaining the railway the supreme court affirmed the decision of the United States circuit court of appeals and settled one of the most important rate cases since the creation of the Ohio railway commission. The court ruled that transportation of "lake cargo" coal must be interstate commerce, saying: "The so called 'lake cargo coal' is necessarily shipped beyond Cleveland or Huron. If it stops there, another and higher rate applies."

Cincinnati—The Southern Retail Coal Merchants' Association will hold its annual convention in Cinciniati on June 12, and the Michigan, Ohio and Indiana Coal Operators' Association will meet June 12 and 13. The Kokoals will hold their national pow-wow at the same time.

Cambridge—The miners and operators in the Cambridge district have signed the scale for the coming two years and arrangements are being made to put the mines in full operation. Many are already being worked.

St. Clairsville—The Virginia Hill Coal Co., of Belmont County, has been placed in the hands of J. D. Jordan as receiver, as the result of a friendly suit instituted by the W. H. Pattison Supply Co. The company's affairs have been involved for some time and this method was taken to straighten them out. The authorized capital stock of the corporation is $700,000.

Pennsylvania

BITUMINOUS

Irwin—The store and warehouse of the Berwind-White Coal Mining Co., at Herminie, a mining town near here, were destroyed by fire, May 29. The plant is a total loss and the whole town, which consists of miners' dwellings, was swept by the flames. Aid was asked from other towns.

Kaylor—There has been some trouble here, and more is expected on account of the eviction of striking mine workers from houses which belong to the Great Lakes Coal Co. The men have been out on strike since Apr. 1, demanding a wage scale in accordance with the Cleveland agreement.

Charleroi—Officials of the miners' organization are hopeful that the strike at the mine of the Clyde company, near Fredericktown, which has been in progress since Apr. 1, will be settled shortly. The men struck there for the scale agreed upon at the Cleveland convention, and the mine has been idle ever since. For the past four years the mine has been operated nonunion. The operators have made some concessions, but the men are standing out for the scale as paid elsewhere in the district.

Dubois—Kelly brothers, who recently purchased the holdings of the Richmond Coal Co., and are now busy at work get-

ting the plant at Savan in shape for active operations, a few days ago purchased 100 acres of land adjoining their property on the southeast. The price paid was reported as $70 per acre.

Johnstown—The Blue Bird shaft, of the Portage Coal Mining Co., was completely flooded as the result of the bursting of a water main, May 27, and over 250 miners were thrown out of work. It was announced that work would not likely be resumed for several days.

Although the coal market is a trifle dull, the Greenwich Coal & Coke Co.'s operations, in Somerset County, have been running steadily every day and the contracts are of such a nature that the company assures the men that very little, if any, idle time may be expected during the coming summer. New men are being employed every day. Mine No. 8, near Shankstown, which had been shut down for about two years, was reopened, May 20.

About 200 new dwellings are being erected by the Consolidation Coal Co., at Acosta. The company has an extensive coal field in this section and has a large opening in operation at present, with an output of about 1500 tons daily.

Connellsville—Freight rates on coke from this district shipped to Youngstown and other sections were attacked as too high before the Interstate Commerce Commission, May 27, in hearings on complaints of the Youngstown Sheet & Tube Co. and others against the Pittsburgh & Lake Erie R.R., and the Connellsville Coke Producers' Association against the Baltimore & Ohio, the Pennsylvania and other railroads. That the independent iron and steel producers of the Youngstown district of Ohio and western Pennsylvania will be compelled to build a railroad from the Connellsville coke district through several of the iron and steel districts with a terminal on Lake Erie, unless there is a reduction in the rate on coke, was a statement made by James A. Campbell, president of the Youngstown Sheet & Tube Company.

ANTHRACITE

Scranton—Allegations that certain of the union leaders at the Oxford colliery of the People's Coal Co., at Scranton, have not been reinstated in their positions because of their activity in connection with the union, may lead to a strike. There was no union at the colliery until the recent suspension, during which the mine worked but little, although it ran at full blast during the 1902 strike. The company maintains that it has merely refused to discharge men who worked during the suspension in order to employ others who did not.

About 400 men and boys employed at the Fernwood slope of the Hillside Coal & Iron Co., struck recently and refused to return to work until certain grievances were adjusted. The men are employed under the supervision of two contractors and are paid by them. The miners demanded that the contractors be removed, as they claimed they could make more money working directly for the company.

The organization of the committee which is to investigate the advance in prices of domestic anthracite under the auspices of the New York Merchants' Association has been completed and it is expected that the investigations will be commenced at an early date.

Wilkes-Barre—A gas explosion in the Pettibone mine of the Delaware, Lackawanna & Western Co., early, May 28, injured four men. Two were thought to be dying when taken out. With the aid of the local rescue corps, 60 other miners made their escape without injury.

It has been announced that all the large anthracite coal companies will make a flat 10 per cent. increase in the wages of their hoisting engineers, thus bringing their rate on a par with the other mine workers. Indications were that some of the companies would grant only a 5 per cent. increase while others did not seem disposed to grant any and no little disappointment was felt in consequence.

Hazleton—At the offices of the United Mine Workers here, it was given out that the wages of all carpenters employed about the coal mines will benefit by the 10 per cent. increase recently granted the other men. Most of the carpenters were members of the union of that trade in this city and were surprised to learn that they will share in the advance. In doing so, however, they become subject to the union jurisdiction of the miners and are being asked to joint that organization.

Resumption of work at the mines has been marked in this as well as in other regions by a number of local strikes, chiefly with the object of bringing non-union workmen into the organization. Strikes of this nature took place recently at Coleraine and at the Hazleton Shaft colliery of the Lehigh Valley Coal Co.

Utah

Provo—The railroad from Helper to the coal lands in Carbon County, owned by the Knight interests, is now assured, and it is given out by the engineers in charge that the road will be in operation by next fall. A fully equipped coal-mining camp will be established and in readiness to ship coal by the time the road is finished. The road is to be run from Helper, on the main line of the Denver & Rio Grande, to the coal beds, a distance of 4½ miles, and will cost upward of $250,000, aside from the rolling stock. Right-of-ways have been secured and everything is now in readiness to begin the building of the road, and the contract for its construction is to be let at an early date.

Washington

Spokane—A. B. Ward has announced that he will form a company to develop his coal property at Peone prairie. Work will be started this summer. Mr. Ward states that he is confident that coal will be found in large quantities.

West Virginia

Charleston—Striking miners of the Paint Creek Colliery Co., at Mucklow, Md., attempted to massacre a dozen Baldwin mine guards, May 31. One hundred shots were fired at the unarmed detectives *enroute* from their sleeping house at the mines to their boarding house for breakfast. All escaped but one, who was wounded in the side. The injury was not fatal. The miners at Paint Creek are the only ones in the state on strike, having refused to accept the scale agreed upon.

A big coal development will be started by the Berwind-White interests in Fayette County within the next few weeks. The land to be developed lies between Pack's Branch and Paint Creek, in the Fayetteville district. The tract contains 6000 acres, and was purchased by the Berwind-White interests from the McKinley Land Co. This development has been under contemplation for two years or more. Already a number of houses are being constructed, some of which will be completed within the 30 or 40 days.

Wheeling—The joint conference scale committee of the miners and operators of eastern Ohio reported to the general conference, May 31, that they were unable to reach an agreement. Differences must be adjusted by the conference itself.

Williamson—The United Thacker Coal Co. has increased its holdings in West Virginia from 8,000 to 65,000 acres. Under the West Virginia law a corporation can hold up to 10,000 acres without paying a special tax. The United Thacker Coal Co. now pays a special tax on 55,000 acres in this state.

Wyoming

Kemmerer—Work on the new mine of the United States Coal Co., at Adaville, is progressing favorably. The name of the camp has been changed to Conroy. A new steel tipple has been ordered and will be installed as soon as the railroad is completed, work on which will begin early next month, the track being laid over the old grade from Moyer. It is expected that the shipment of coal will commence about the first of September.

Canada

Edmonton, Alberta—All the buildings belonging to the Western Coal Co. at its mine in the Clover Bar mining district, were destroyed by fire, May 26. Loss, $75,000.

Personals

John F. Chilcott, superintendent of construction for the Allegheny River Mining Co. Kittanning, Penn., has resigned, effective June 5.

Eli T. Conner, consulting mining engineer, of Philadelphia, Penn., is making a business trip to Newfoundland where he will remain for a week or ten days.

G. W. Seiler, formerly with Pattison & Bowns, at No. 1 Broadway, New York, is now in charge of the anthracite department of the A. W. Hillebrand Co., at the same address.

C. V. Gould, general manager of the United States Coal Co. recently spent several weeks at Adaville, Wyo., looking after the development of the company's new mine at that point.

W. R. Crane, dean of the School of Mines, Pennsylvania State College, will leave for Alaska about June 15, and will spend the coming year studying the mineral resources of that country.

Henry L. Badham, of Birmingham, Ala., president of the Bessemer Coal, Iron & Land Co., is spending a few weeks traveling in Europe. William S. Lovell, vice-president, is looking after Mr. Badham's duties during his absence.

P. W. Turner, mine foreman for the state of Alabama, at the Banner mine of the Pratt Consolidated Coal Co., which is operated with convict labor, by the state, has been appointed by Gov. O'Neal, superintendent of the mine, effective at once. Mr. Turner succeeds William L. Martin, whose resignation was announced a short time ago.

S. D. Warriner, vice-president of the Lehigh Valley Coal Co.; W. J. Richards, vice-president of the Philadelphia and Reading Coal Co. and W. L. Connell, of Scranton, an independent operator, have been reëlected as representatives of the anthracite operators on the board of conciliation provided for by the anthracite strike commission of 1902.

Effective June 1, 1912, the following changes have been made in the operating department of the Lehigh Valley Coal Co., Wilkes-Barre, Penn.: J. M. Humphrey, formerly division superintendent of the Mahanoy and Shamokin division, with headquarters at Centralia, has been appointed mining engineer, with headquarters at Wilkes-Barre, vice A. B. Jessup, who recently resigned to become general manager of the G. B. Markle & Co. properties at Jeddo. H. J. Heffner, formerly division engineer of the Mahanoy and Shamokin division, has been appointed superintendent of that division, vice J. M. Humphrey, transferred. G. P. Troutman, formerly division engineer of the Lackawanna division, Pittston, Penn., is appointed assistant superintendent and engineer of that division.

Obituary

Frank E. Lukens, secretary of the Illinois and Wisconsin Retail Coal Dealers' Association, committed suicide in the Best Hotel, Chicago, May 27. Threatened governmental investigation of retail fuel associations, which had resulted in the withdrawal of a number of members from the one in which Mr. Lukens was interested, is said to have been the cause of his act, although the organization of this association thoroughly conforms with the law. Mr. Lukens was exceptionally well known in retail coal circles.

Construction News

Marion, Ill.—The Big Muddy Fuel Co. is receiving bids for a washer of from 300 to 500 tons capacity, to be built at their mine north of here.

Big Stone Gap, Va.—C. B. Slemp and others of this section are considering the development of coal property near Hazard, Ky. Among those interested is John C. C. Mayo, of Paintsville, Ky.

Pineville, Ky.—The Moss Coal Co. has leased a tract in Letcher County, near Whitesburg, and will open a mine at once. The mine will be located on the extension of the Lexington & Eastern R.R., which is now being completed.

New London, Conn.—Bids will be received until June 15, by Capt. F. T. Arnold, for constructing, at Fort Terry, N. Y., a coal-handling and storage plant, consisting of frame building with concrete floor and footings, industrial railway, motors, etc.

Whitesburg—The Mineral Development Co., of Philadelphia, has announced plans for the construction of coking plants near the head waters of the Kentucky River, in Letcher County. The plant will be reached by the extension of the Lexington & Eastern R.R.

Brownsville, Penn.—The contract for new construction work at the plant of the Lilley Coal & Coke Co., has been awarded to the Dravo Contracting Co., of Pittsburgh. This contract was erroneously reported as awarded to the Drake & Straton Co., of Pittsburgh.

Birmingham, Ala.—The Central Coal Co. has announced that it will expend about $100,000 in improving its property in the Warrior coal field. The work will include a modern tipple, new electrical equipment, coal-cutting machinery and a system of haulage in the mines. B. F. Roden, Birmingham, is president.

The Woodward Iron Co. has awarded a contract for the construction of a coke bin of about 500 tons capacity.

Chattanooga, Tenn.—The Durham Coal & Iron Co. is negotiating for the purchase of a large body of mineral and timber land in Sequatchie Valley, on the Southern R.R., and will expend $5,000,000 in developing the property and increasing facilities. The land is rich in iron ore, coal and timber. This company plans to erect a large steel mill, several blast furnaces, coke ovens and byproduct plants. The principal industrial plants of the company will be located at Moccasin Bend, all of which land the company recently acquired.

The Chattanooga Coal & Iron Co. contemplates installing a battery of 60 Koppers byproduct coke ovens.

Publications Received

JOURNAL OF THE WESTERN SOCIETY OF ENGINEERS, May, 1912. 95 pp., 6x9 in., illus. 50c. Office of the Society, Chicago.

SUPERHEATED STEAM IN LOCOMOTIVE SERVICE. By W. F. M. Goss. Bulletin No. 57, University of Illinois. 66 pp., 6x9 in., illus. 40c.

The bulletin presents in abridged form information which originally appeared as Bulletin No. 127 of the Carnegie Institute of Washington.

THE USE OF PERMISSIBLE EXPLOSIVES. By J. J. Rutledge and Clarence Hall. Bulletin No. 10, U. S. Bureau of Mines. 34 pp., 6x9 in., illus. Government Printing Office, Washington.

Investigation has shown that one of the commonest causes of disastrous explosions in the coal mines in this country has been blown-out shots of black blasting powder or dynamite. The dangers that attend the use of these explosives were perceived several years ago, and in consequence the attention of powder manufacturers was directed to the production of explosives that would be less liable to ignite inflammable gas or dust. The manufacturers have been so successful in their efforts that it is now possible to obtain explosives which yield much shorter and quicker flames than black blasting powder or dynamite, and hence are much less dangerous to use in fiery or dusty coal mines. An explosive is termed a permissible explosive when it is similar in all respects to a sample that has passed certain tests by the Federal Bureau of Mines.

The bulletin describes the proper methods of using these explosives with some notes on electric shot firing, undercutting and drilling. The characteristics and advantages of the permissible forms are explained and it is noted that the cost of blasting per ton of coal is only slightly increased by their use if indeed there is any increase at all.

Trade Catalogs

Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Booklet. Private Telephone Systems. 24 pp., 3½x6¼ in., illus.

Electric Weighing Co., New York. Bulletin No. 4. Modern Weighing on Conveyors—The Electric Weigher. 20 pp., 6x9 in., illus.

Hyatt Roller Bearing Co., Newark, N. J. Bulletin No. 604E, Hyatt Roller Bearings as Applied to Mine and Industrial Cars. 24 pp. 7x10 in., illus.

Link-Belt Co., Philadelphia and Chicago. Book No. 121. The Ewart Friction Clutch. 16 pp., 6x9, illus. Pamphlet. Link-Belt Locomotive Cranes. 32 pp., 6x9 in., illus.

E. I. Dupont de Nemours Powder Co., Wilmington, Del. Blasting Supplies, pamphlet, 120 pp., 6x9 in., illus. Thawing Dynamite, pamphlet, 24 pp., 6x9 in., illus. Storage for Explosives, pamphlet, 27 pp., 6x9 in., illus. High Explosives, pamphlet, 136 pp., 6x9 in., illus. These publications, in addition to describing and listing the products of the Du Pont company, contain much interesting and valuable information relative to explosives, handling, storing and using the same.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

During the past week the anthracite trade has continued the predominating feature in coal circles. The advance in prices on domestic grades has resulted in much bitter opposition on the part of the consumers, who at some points are forming associations for the purpose of investigating the hard-coal companies, with a view to restraining them from the new increase.

As we predicted, the anthracite advance was confined almost entirely to the domestic grades, it being impossible to increase the steam sizes because of the competition in this trade with the soft-coals. Since it was thus feasible to advance quotations on only a portion of the product, it was necessary to make this unusually heavy, which has excited much unfavorable comment.

In the Eastern market there is considerable soft-coal coming forward, which is being offered at liberal discounts from the nominal prices. Spot business generally is dull, although probably about normal for this period of the year, and the market promises to be slow and heavy for the next two months. The Pittsburgh district reports a heavier demand now than at any time since the suspension; stocks appear to be about worked off, and some operators are producing up to nearly full capacity, the demand from the Lakes being particularly heavy.

In Ohio the Lake demand is the best feature of the trade, and there is some evidence of improvement in the steam sizes, although prices still continue low. Business has eased off in West Virginia, but there has been a heavy movement to the Lakes and the West, and operators are holding firm on prices. Railroad congestions, due to the flood in the Mississippi Valley, has interfered with the movement from Alabama and resulted in a slowing down in production there.

The Middle Western market continues slow and heavy, except Indiana. An agreement between the miners and operators has finally been effected there, which will probably result in at least a temporary heavy production until the district catches up on its orders.

Boston, Mass.

The stand taken by certain of the New River interests in sticking to $2.70, f.o.b. loading port, be the tonnage large or small, is a favorable sign. Until all take this attitude, however, not much improvement can be expected in the price situation. An amount of coal is still coming forward on a liberal discount off the nominal price, and no change is in sight, in that respect. The prediction that June and July were likely to be dull in bituminous need not be changed.

On the Pennsylvania grades it develops that there will still be anthracite transportation available for this market. Hard-coal is coming down so slowly that the roads with floating equipment are bound to be in the soft-coal freighting business to a certain extent, and this will keep outlet open to coals from the Pennsylvania districts and Georges Creek that would ordinarily be served from Hampton Roads.

Anthracite shipments began from Philadelphia the week of May 27, but only in small volume. Some of the collieries are up to but 50 to 60% of normal efficiency. Taking this, together with the reported withdrawal from the tide market of certain of the anthracite companies, and their general inactivity at this time, the Eastern dealer is going to have difficulty in getting his coal.

Wholesale prices are about as follows:

Clearfields, f.o.b. mine	$1.10 @ $1.35
Somersets, f.o.b mine	1.20 @ 1.35
Clearfield and Somersets, f.o.b. Philadelphia	2.35 @ 2.60
Georges Creek, f.o.b. Baltimore	2.77 @ 2.87
Pocahontas, New River, f.o.b. Hampton Roads	2.70
Pocahontas, New River, f.o.b. cars Providence	3.40 @ 3.50
Pocahontas, New River, f.o.b. cars, Boston	3.40 @ 3.60

New York

Anthracite—Arrivals of hard coal continue to come in slow, and the mines are reported to be working only about 50 to 60 per cent. capacity. No orders are being accepted by the large companies for stove except for July deliveries, and the Nos. 2 and 3 steam grades are short in supply, although there is plenty of the No. 1 available.

Consumers are not buying to the extent that was expected, due probably to the hope that the investigation now being conducted by the merchants' association will result in a reduction in prices on the domestic sizes. The larger companies, however, report an active demand from the dealers, and it is evident that the latter are replenishing their depleted stocks as rapidly as possible in anticipation of an active demand during the fall and winter.

The following are the wholesale f.o.b. quotation, those for the Lackawanna and Wyoming being at the upper ports and the Lehigh and Schuylkill for the lower.

	L.&W.	L.&S.
Broken	$4.70	$4.65
Egg and stove	4.95	4.90
Chestnut	5.20	5.15
Pea	3.50	3.45
Buckwheat	2.75	2.65
Rice	2.25	1.95
Barley	1.75	1.70

Bituminous—Last week is said to have been one of dullest in the history of the soft-coal market here; this is not, however, unusual for this period of the year. On the whole, the trade is holding up as well as could be expected at this time, and indications are for an active business this fall. Supplies are being worked down some and tonnages will probably show some improvement soon, although it is doubtful if there will be any advance in prices. Stocks on hand at South Amboy are quite large, and there are rumors of embargoes being declared there. Same contracts are being closed at an advance over last year's figures.

We continue to quote prevailing wholesale prices as follows, although there is some shading from these:

West Virginia, steam	$2.35
Ordinary grades, Pennsylvania	2.45
Fair grades, Pennsylvania	2.55@2.65
Good grades, Pennsylvania	2.70@2.80
Best Miller, Pennsylvania	3.00
Georges Creek	3.15

Pittsburgh, Penn.

Bituminous—Manufacturing demand has improved, and is better than at any time since before the suspension of mining. The stocks seem to have been practically all worked off. Shipments in the Lake trade are now very heavy, with a good supply of vessels. Operations in the Pittsburgh district on an average are much heavier than a fortnight ago, having been steadily increasing; the Pittsburgh Coal Co. reports that it is operating up to its capacity. Prices are quoted on the regular season basis, though they are occasionally shaded, particularly for slack: Mine-run and nut, $1.22½; ¾-in., $1.32½; 1¼-in., $1.47½; slack, 82½c. per ton at mine, Pittsburgh district.

Connellsville Coke—Active negotiations continue for furnace coke for second-half delivery, and prices are firm. None of the sellers are asking less than $2.50, and some more. In exceptional cases, where the buyer is certain of taking deliveries under unfavorable market conditions, the $2.50 price might be

shaded a trifle. Thus far between 40,000 and 50,000 tons a month have been placed under contract for the second half, at from $2.35 to $2.50, and there remains to be covered probably about 100,000 tons a month. Sales of about 35,000 tons of furnace coke for June delivery have been made at from $2.25 to $2.35, but occasionally $2.25 is shaded for prompt shipment. Foundry coke is somewhat stiffer, particularly on contract. We quote: Prompt furnace, $2.20@2.30; contract furnace, $2.40@2.50; prompt foundry, $2.35@2.50; contract foundry, $2.40@2.75.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending May 18 at 394,316 tons, a decrease of 4640 tons, and shipments at 4194 cars to Pittsburgh, 6467 cars to points west and 1132 cars to points east, a total of 11,793 cars, or a decrease of 149.

Philadelphia, Penn.

Taking the coal trade as a whole, the last week has not been altogether propitious in this locality. It is true that some coal is moving off, notably stove, chestnut and pea sizes, but as for an actual, insistent demand, which, as a rule, characterizes the month in which the lowest prices are announced, it is not present. There is considerable space in the papers devoted to articles about investigations into the advance in prices, and the attendant agitation which it brings about has its effect in causing householders and others to delay making purchases, but it would seem that this is altogether unnecessary, as the raise in prices is only what was to be expected.

The wholesale market is good, particularly at tidewater. It is understood that the companies are well supplied with orders for Eastern and Southern ports, and are only hampered in shipment by the lack of vessel facilities.

Bituminous conditions have not in the least improved, and compare with the very serious setback this branch suffered during last summer. The determination of the anthracite miners to resume work destroyed any hope that may have been felt that conditions would improve, and until stocks of coal, accumulated earlier in the year, are disposed of, there is little to look forward to.

Baltimore, Md.

Although one or two of the larger companies are reporting an active demand, the smaller operators claim that the Baltimore market, so far as they were concerned, is dull. There is only a fair demand for the product, and low prices prevail. Many Baltimore companies depend largely on spot orders, because there is more profit in such sales, and this business has been conspicuous by its absence and with no indications of improving.

Of course, coal is moving under existing contracts, which were placed some time back by companies that consume fuel steadily month in and month out, and it is safe to say that nearly all of the coal in which the local trade is concerned, is moving under contract.

The Consolidation Coal Co. is now operating seven of its new mines opened in the Elkhorn Valley of Kentucky, and the product is being stored to be shipped when the railroad now under construction is completed, which will be in August.

Buffalo, N. Y.

There is no improvement in the demand for bituminous and none is looked for right away, as there is still too much coal in the consumers' hands, bought before or during the early part of the suspension. There are a few consumers getting to the end of their supply, but there are mines starting up and quite likely turning out more coal than the increased consumption demands.

Sometimes there is such a demand for slack at this period of the year that it insures a fair profit for everything, but such is not the case now; the slack market is not nearly as good as during the past two summers. Consumption is at least fair, but there is too much coal; all effort to restrict the production of bituminous fails and there is now no further talk of this.

The price of bituminous coal is weak at former bottom quotations, $2.57½ for Pittsburgh three-quarter, $2.47½ for mine-run and $2.10 for slack, with Allegheny Valley 15 to 25c. lower. Coke is very quiet at former figures, based on $4.25 for best Connellsville foundry.

The movement of anthracite began about May 27, when water tonnage for the upper lakes was first loaded this season. There is complaint that miners are scarce, but 54,000 tons being loaded in four days and this chiefly by a single company. That branch of the business will be very active for the rest of the season and efforts will be made to wipe out the lead of 600,000 tons which last season has over the present one.

Cleveland, Ohio

There has not been any improvement during the past week in the coal business, and only a small amount has been shipped to this market on consignment, which it has been found very difficult to dispose of. Coal has remained on track for a week or more with car service accruing and without any chance of disposing of same. There still seems to be considerable left over from purchases made prior to the strike, and general business in the manufacturing line does not seem to improve to any extent.

There is a very small amount of coal coming forward for the Lake trade. Buyers seem to be holding off in placing contracts, and the few fortunate ones that have made contracts cannot run their mines to full capacity on account of the lack of men.

Columbus, Ohio

The coal trade in Ohio during the past week was rather active, despite the fact that a holiday broke in and curtailed production to a certain extent. With the exception of domestic grades, there was a considerable production in most of the Ohio fields and the outlook for the future is considered good. While prices are still low and will probably remain so for some time, improvement in that direction can be expected toward the latter part of the summer.

There is some activity in steam grades, due to the fact that certain manufacturing establishments still have a surplus interfering with new orders. Business generally is fair and the requirements for steam purposes are good, although the movement is not large. There is some renewing of steam contracts at the price prevailing last season, plus the added cost of mining.

Considerable interest has been directed toward certain railroad contracts which will be awarded within the next week or 10 days. A number of the larger producers are strong after these contracts, which are among the largest in this section. Among the contracts to be let are the New York Central, the Ann Arbor and the Piere Marquette.

Prices which prevail in Ohio are as follows:

Hocking Valley	
Domestic lump	$1.50
¾-in.	1.35
Nut	1.15
Mine-run	1.15
Nut, pea and slack	0.75
Coarse slack	0.65
Pittsburgh No. 8	
Mine-run	1.10
¾-in.	1.20
Coarse slack	0.70
Pomeroy Bend	
Domestic lump	$1.50
¾-in.	1.35
Nut	1.20
Mine-run	1.15
Nut, pea and slack	0.75
Coarse slack	0.50
Kanawha	
Domestic lump	1.50
¾-in.	1.30
Nut	1.15
Mine-run	1.10
Nut, pea and slack	0.75
Coarse slack	0.65

Hampton Roads, Va.

There has been little activity at Hampton Roads during the past week. Shipments from the mines have been light, thus keeping down the stock of coal at the three piers; a heavy tonnage has been moving West and to the Lakes.

Some interest was aroused by the arrival of the German fleet, Thursday morning, the interest reaching an acute stage when it was learned that the coal for the

three vessels constituting the fleet would not be furnished by local shippers. No better steamship fuel can be obtained at any port in the country than that furnished by the Hampton Roads shippers, who were confidently relying on bunkering the German fleet.

Dumping figures for the month of May do not show up as well as the previous month; in fact, this could not be hoped for. The Norfolk & Western piers again lead with 523,071 tons (over two million tons having been loaded on that line during May, the highest figure ever reached by them); Chesapeake & Ohio Ry., 370,055; and the Virginian Ry., 189,689, the later piers dumping some thirty odd thousand tons more than in April in spite of the general decrease in dumping.

Charleston, W. Va.

Conditions remain good in West Virginia, especially in the southern and central districts. As yet there has been no letup in the supply of cars, but operators fear a change in this respect. More mines are in operation this week than there were last week. A number of the operations owned by the Paint Creek Collieries Co., employing about 1500 men, which have been idle since shortly after the first of April, are now in operation, but only a small number of men are at work. The mines are being operated by nonunion men.

Lake shipments, while heavy, are giving the shippers some concern, owing to the congested conditions both at the Lakes and along the Hocking Valley road, extending into the mining region in the Kanawha district. Lake shipments have moved with considerable speed, due to the abundant motive power.

Prices have been fair, the expected falling off, usual at this time of year, having not materialized and no drop is anticipated in the immediate future.

Birmingham, Ala.

The past week has developed a dull market for Alabama coal and the prospects are not considered so bright as they appeared some days ago. Coal operators have failed to show a firm front and as much as 10c. off per ton has been quoted during the week.

The extremely warm weather which has prevailed during the past week is considered an important factor. It is also probable that the shutting off of shipments to Mississippi River points and the West by the flood resulted in a temporary congestion and surplus, which, it is hoped, will be overcome as normal conditions return.

All of the mines are operating full time with the exception of a few of the smaller ones, which have lost a day or two during the past week. Some of the operators are even complaining of a difficulty in getting sufficient mine labor. The iron-furnace companies that engage in coal mining are demanding labor more than others. The coke market is feeling the dull period but prices are maintaining a fair front.

Nashville, Tenn.

We are having our usual period of summer dullness in this field. In fact, it is duller than usual, which is strange in view of the fact that the Indiana miners have not returned to work, and the union fields of western Kentucky have only been at work two weeks. This clearly indicates what has been felt for some time—that there is a vast over-production of coal in our section.

Though there is no business at any price, and some of the operators have gone down to their usual cost of production quotations, the majority are not trying to create a demand. They know that it does not exist at low prices and are using their best efforts to keep quotations up so as to enable them to obtain better prices for their product after Aug. 1. It remains to be seen whether or not this can be accomplished.

There is no demand for lump at any price and mine-run is being offered from 75@85c., nut $1.10@1.25, and 1¼-in. screenings 40@50 cents.

Indianapolis, Ind.

The resumption of coal mining in Indiana, after a suspension of two months, during which time numerous meetings and conferences were held without avail, is hailed with delight by the miners, operators and the country in general.

The Indiana mines all resumed work Monday, June 3, under a new wage scale with a slight advance, and it is believed there will be work enough for every miner in the state. Orders have been piling up at the mines, and if the railroads handle the product, some large outputs will be made.

There is a difference of opinion among the retail dealers relative to an advance of 25c. a ton on coal. Some of the dealers say it would be an outrage at a time of general unrest and discontent, due largely to the cost of living and the unprecedented long and cold winter.

Chicago

The price of anthracite advanced 25c. a ton June 1. No open antagonism has been shown, so far as the increase is concerned, but the buyers believe it a wise policy to await the outcome of the fight begun by Eastern retailers against the advance.

With the opening of the Indiana mines, Illinois operators are now preparing to fix the price on several large contracts, which will have an exceptionally important bearing on bituminous prices generally. Screenings are scarce, current prices ranging all the way from $1 at the mines to $1.10 for spot coal. Smokeless coal has not been abundant on the spot market and prices are firm.

Prevailing prices at Chicago are:

Sullivan County	
4-in. lump	$2.47
Egg	2.37
Steam lump	2.99½
Screenings	1.87@1.97
Springfield	
Domestic lump	$2.32
Steam lump	2.07
Mine-run	1.97
Screenings	1.97
Clinton	
Domestic lump	$2.27
Steam lump	2.12
Mine-run	1.92
Screenings	1.77@1.87
Pocahontas and New River	
Mine-run	$3.15
Lump and egg	3.55

Coke—Prices asked for coke are: Connellsville and Wise County, $4.75; byproduct, egg and stove, $4.65; byproduct, nut, $4.55; gas-house, $4.75.

Minneapolis—St. Paul

The coal trade in the Twin Cities has shown very little activity during the past 10 days. Coal men cannot figure out why the market is not stronger than it now is with Indiana not working, and only about 50 per cent. of Illinois mines in operation. Coal is coming up to the head of Lakes slower than usual and with these conditions there should be a better market.

Should but 75 per cent. of the crop prospects materialize it will create a condition with which the transportation companies will find it a physical impossibility to cope with. A number of railroads in this territory are already beginning to call in their rolling stock.

Coal men report some steam business but say that contracts are being closed at extremely low prices, a number being let at $3.25 for Youghiogheny, and it is rumored the price is as low as $3 at the head of the Lakes. Prices are out for June 1 on hard-coal on the basis of $7 for nut; $6.75 for stove and egg, and $5.75 for pea sizes.

St. Louis, Mo.

The market in St. Louis is intensely dull. There is no demand for coal and the only business in sight is the few contracts that are being let.

There is one order in St. Louis that calls for 200 tons of mine-run coal per day. Destination weights govern settlement, and in the past it is understood this contract brought $1.05 on a mine basis for a mine-run coal. The contract has not been awarded as yet, but some of the bidders have quoted as low as $1.02½ it is rumored; yet they claim that it costs them from 12c. to 15c. per ton more to produce coal this year than last.

The storage stocks around St. Louis are being cleaned up, and it is likely that there will be a small demand for steam coal about June 15. Illinois mines are

gradually resuming, but all the operators claim they are working at a loss. The prevailing prices are:

Carterville	
Lump and egg	$1.25@1.35
Nut	1.20@1.30
Mine-run	1.05@1.15
Screenings	1.05@1.10
Franklin county coal prices rule about 10c. higher than the above.	
Mount Olive	
2-in. lump	$1.25
2-in. screenings	1.05
Standard	
2-in. lump	$0.85@0.90
2-in. screenings	0.85@0.94
1x2 nut	0.85@0.90
Mine-run	0.85@0.94

A heavy tonnage of anthracite orders was placed the past week, stove leading the others. The market for June, St. Louis, is: Chestnut, $7.15; egg and stove, $6.90; grate, $6.65. There is very little coke moving forward.

Portland, Ore.

There is absolutely no change in the coal situation here; the market is dull and little is expected till people begin putting in supplies for next winter. This movement will probably begin next month. The Consumers' Coal Co. is a new concern doing business here, selling wholesale and retail, and it deals principally in Wellington coal.

Freights from Australia are very high this year, and it is doubtful if there will be much coal imported early in the season from that source unless charter rates show a material reduction. This is not considered likely, however, unless ship owners find very remunerative business out of the Northwest when the wheat begins to move.

Production and Transportation Statistics

The Virginian Ry.

Total shipments of coal over this road for April of the current year amounted to 280,995 short tons.

The Car Situation

The ending of the strike among the miners in the anthracite district brought about a sharp reduction in the number of idle cars reported by the American Railway Association as of May 23. The total net surplus on that date was 116,201, as compared with 130,008 reported two weeks earlier.

The following table shows the surplus and shortages of cars on 163 roads on May 23 last:

	Surplus	Short	Net Surplus
Box	23,298	2,918	20,380
Flat	4,053	1,618	2,435
Coal, gond. and hopper	71,068	2,649	68,419
Other kinds	25,264	297	24,967
Total	123,683	7,482	116,201

Pennsylvania Railroad

Statement of coal and coke carried on the P. R.R. Co.'s lines east of Pittsburgh and Erie during April and the first four months with the increase or decrease over the same period last year, in short tons:

	April	4 mos.	Difference
Anthracite	290,865	3,579,602	— 587,210
Bituminous	3,291,985	15,461,920	+2,157,985
Coke	1,079,046	4,190,832	+ 550,958
Total	4,661,896	23,232,354	+2,121,733

Baltimore & Ohio R.R.

The following is a statement of the coal and coke tonnage moved over the B. & O. and affiliated lines during the month of April, 1912, as compared with the corresponding month of the previous year:

	1911	1912
Coal	2,053,085	2,122,285
Coke	337,183	390,228
Total	2,390,268	2,512,513

Coal Exports

According to figures just issued by the Department of Commerce and Labor, Bureau of Statistics, our coal exports rank eighth in importance, for the ten months ending with April of this year. The following is the value of our export trade in millions of dollars:

Raw cotton	585
Iron and steel manufacture	260
Meat and dairy products	160
Breadstuffs	135
Copper	110
Mineral oil	100
Lumber, etc	90
Coal	50

Norfolk & Western Ry.

The following is a comparative statement of the coal and coke shipments over the lines of the N. & W. Ry. for the months of April, 1911-12, in short tons:

Destination	1911	1912
Coal		
Tidewater, foreign	90,562	223,220
Tidewater, coastwise	212,279	313,076
Domestic	1,063,887	1,325,259
Coke		
Tidewater, foreign	8,132	7,744
Domestic	138,997	108,601
Total	1,513,857	1,979,900

Foreign Markets

Great Britain

A better inquiry has set in, and the market shows signs of improvement for June shipments. Prices are approximately as follows:

Best Welsh steam coal	$4.38
Seconds	4.20
Thirds	3.90
Best dry coals	4.26
Best Monmouthshire	3.84
Seconds	3.66
Best Cardiff small coal	2.42
Seconds	2.38

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days, less 2½ per cent.

Spanish Imports

Spanish imports for the three months ended March 31, chiefly from Great Britain were as follows in metric tons:

	1911	1912
Coal	173,539	614,593
Coke	83,156	108,669

The Chinese Market

There has been another quiet fortnight on this market and although a few small contracts have been concluded there is very little demand locally and only small inquiry: forward, there is, however, a better feeling among native dealers and banking facilities are now easier, but money is still very tight. Prices are steady but freights are ruling high and are likely to remain so for some time.

Manchurian Coal—Stocks continue to decrease owing to the scarcity of tonnage.

Kaiping Coal—The usual deliveries have been made under contracts but there is not much new business to export. Prices remain steady and firm.

Financial Notes

Consolidation Coal Co.—Operating expenses of this company for 1911 were $8,467,662, as compared with $9,186,013 for the year 1910. Plant depreciation for 1911 was $221,618, as compared with $251,410 for 1910.

American Coal Products Co.—The $1,250,000, 5% serial gold coupon notes of 1910 of this company have been called for redemption and will be paid by the Guaranty Trust Co., of New York, at par and interest on presentation on or before June 1.

The Delaware & Hudson Co.—From the sale of $7,000,000 additional first and refunding mortgage gold bonds mentioned in last year's report, this company realized $6,825,000; the discount of $175,000 was charged to profit and loss. The floating debt was decreased $3,594,320 during 1911.

Colorado Fuel & Iron Co.—Earnings of this company for the first eight months of the present fiscal year are about $126,000 in excess of those for the corresponding period of 1911, and indications are that the surplus for the year ending June 30 will approximate $1,500,000. This will be a substantial improvement over last year's surplus of $1,260,000.

Alabama Consolidated Coal & Iron Co.—The interest on the $2,084,000 consolidated 5's due May 1 has been defaulted. President Hoagley explains that, after consultation with Harvey Fisk & Son, who are managers of the syndicate which will underwrite the new securities to be issued under the plan of merger with the Southern Iron & Steel Co., it has been decided to take advantage of the clause which gives the company 12 months in which to meet interest before foreclosure proceedings can be brought.

Woodward Iron Co.—On the basis of past years this new corporation should start by earning annually at least $1,000,000, which will be sufficient to meet all charges of dividend requirements. A sinking fund, commencing 1917, is provided on the basis of 3c. for every ton of coal mined with a minimum for each year for ½ of 1% on the total principal amount of bonds outstanding. It is further provided that after 1939 the minimum shall be increased sufficiently to retire the remaining bonds at or before maturity.

Index of Coal Literature

Monthly list of the world's best articles on coal and coal mining

The following is a list of abbreviations used below:
A.E.G.-Ztg. = A.E.G.-Zeitung.
Am. Lab. Legis. Rev. = American Labor Legislation Revue.
Ann. Mines = Annales des Mines.
Ann. Mines Belgique = Annales des Mines de Belgique.
Austral. Min. Stand. = Australian Mining Standard.
Berg-Huttenmänn. Rdsch. = Berg- und Huttenmännische Rundschau.
Bull. Am. Inst. Min. Eng. = Bulletin American Institute of Mining Engineers.
Can. Eng. = Canadian Engineer.
Can. Min. Jl. = Canadian Mining Journal.
Chem. Eng. = Chemical Engineer.
Coll. Guard. = Colliery Guardian.
Comp.-Air Mag. = Compressed Air Magazine.
Compt. Rendus Acad. Sc. = Comptes Rendus de l'Académie des Sciences.
El. Eng. = Electrical Engineering.
El. Jl. = Electrical Journal.
El. Kraftbetr. = Electrische Kraftbetriebe und Bahnen.
Eng. Contract. = Engineering Contractor.
Eng. Min. Jl. = Engineering and Mining Journal.
Eng. News. = Engineering News.
Fördertechnik = Die Fördertechnik.
Geol. Mag. = Geological Magazine.
Handel und Ind. = Handel und Industrie.
Int. Mar. Eng. = International Marine Engineering.
Inst. Min. Metal. = Institute of Mining and Metallurgy.
Int. Volkswirt = Internationaler Volkswirt.
Iron Coal Trades Rev. = Iron and Coal Trades Review.
Jl. Soc. Chem. Ind. = Journal of the Society of Chemical Industry.
Jl. Ind. Engin. Chem. = Journal of Industrial and Engineering Chemistry.
Jl. Royal Soc. Arts = Journal of the Royal Society of Arts.
Jl. S. Afr. Inst. Eng. = Journal of the South African Institute of Engineers.
Kohle Erz = Kohle und Erz.
Lumière El. = Lumière Electrique.
Min. Eng. = Mining Engineer.
Mines Minerals = Mines and Minerals.
Min. Sc. Press = Mining and Scientific Press.
Min. World Eng. Rec. = Mining World and Engineering Record.
Mon. Ind. Gaz = Moniteur de l'Industrie du Gazet de l'Electricité.
Montan. Rdsch. = Montanistische Rundschau.
Oesterr. Z. Berg- Huttenwes. = Oesterreichische Zeitschrift fur Berg und Hüttenwesen.
Portefeuille Econ. Machines = Portefeuille économique des machines.
Proc. Acad. Pol. Sc. N. Y. = Proceedings of Academy of Political Science, New York.
Proc. Am. Inst. El. Eng. = Proceedings of American Institute of Electrical Engineers.
Proc. S. Wales Inst. Eng. = Proceedings of South Wales Institute of Engineers.
Rev. Noire = Revue Noire.
Rev. Univ. Mines = Revue Universelle des Mines.
Saarbrucker Berg. Kal. = Saarbrucker Bergmanns Kalendar.
S. Afr. Min. Jl. = South African Mining Journal.
Soz.-Technik = Sozial-Technik.
Stahl Eisen = Stahl und Eisen.
Stein-Braunkohle = Stein und Braunkohle.
Tech. Rdsch. = Technische Rundschau.
Techn. Wirtsch = Technik und Wirtschaft.
Tekn. Tidskrift = Teknisk Tidskrift.
Trans. Inst. Min. Eng. = Transactions Institute of Mining Engineers.
Trans. Min. Inst. Scot. = Transactions of Mining Institute of Scotland.
Trans. Inst. Min. Eng. = Transactions of the Institute of Mining Engineers.
Trans. Manchester Geol. Min. Soc. = Transactions of the Manchester Geological and Mining Society.
Ung. Mont. Ind. = Ungarische Montanindustrie und Handelszeitung.
Z. Damptkessel-Betr = Zeitschrift für Dampfkessel und Maschinenbetrieb.
Z. El. Mach. = Zeitschrift fur Elektrotechnik und Maschinenbau.

Note: We shall be glad to obtain for readers, where possible, copies of the papers referred to.

I—GENERAL

Coal Prices and Cost of Haulage. (Kohlenpreise und Foerderkosten.) Seidl, Techn. Wirtsch., 1912, 1, pp. 47-58, 3 tab. (Research into the causes of the doubling of coal prices in all German districts between 1880 and 1909.)

The World's Coal Supplies and Consumption. Economist, 1912, pp. 111-2.

The World's Coal Production in 1911. (Kohlenproduktion der Welt im Jahre 1911.) Naehr. Handel., 1912, 22, p. 4.

The Coal Resources of Great Britain. G. T. Beilby, Coll. Guard., Vol. 103, 2675, pp. 681-2.

The Coal Deposits of Germany. F. Frech, Engineering, Vol. 93, 2414, pp. 462-3.

Canadian Coal Fields. Coll. Guard., Vol. 103, Sp. Canad. Issue, April, 1912, pp. 1-34, 24 fig., 4 tab. (Canada is destined to become one of the most important coal producing countries in the world and the Canadian government has determined to intelligently husband these enormous resources.)

The Sheridan, Wyo., Coal Field. J. Simmons, Coal Age, Vol. 1, 27, pp. 866-8, 4 fig. (A description of one of the largest producing fields in the west. The coal is classed as sub-bituminous and there are numerous seams of more than ordinary thickness.)

The Sheridan, Wyo., Coal Field. J. Simmons, Coal Age, Vol. 1, 29, pp. 932-4, 4 fig. (The Carney Coal Co. has a mine with a capacity of 4,000 tons per 8-hr. shift. A detailed account of the plant is given with some notes on the Acme Coal Co's. properties.)

1911 Bituminous Mining Law of Pennsylvania. Mines Minerals, Vol. 32, 9, pp. 526-8. (Analysis of those portions of the law which will increase the cost of mining. The sections of the new law are taken up consecutively and compared with the corresponding provisions of the law of 1893.)

The popular Election of Mine Inspectors. J. T. Beard, Coal Age, Vol. 1, 28, pp. 903-5, 2 tab. (Conditions leading to the first coal mining laws enacted in the United States. The inspectors' election by popular vote law, its effect on inspectors; examinations for mine foremen; how the law affects the miners.)

Canadian Coal Mining Laws. Coll. Guard., Vol. 103, 2678, p. 835. (The Dominion and Provincial laws and regulations betray a confusing variety. A complete list is given as far as ascertainable.)

Mine Registration and Checking. A. W. Davidson, Coal Age, Vol. 1, 29, pp. 934-6. (At the Coleman mine of the International Coal and Coke Co.)

On the State of the Question of Renewing the Coal Syndicate. (Der Stand der Erneuerungsfrage des Kohlensyndikates.) Int. Volkswirt, Vol. 22, 2, pp. 17-8.

The Prussian Mining Administration and the Rhenish-Westphalian Coal Syndicate. (Der preussische Bergfiskus und das Rheinisch-Westfaelisch Kohlen Syndikat.) Handel u. Ind., Feb. 10, 1912, p. 147-8.

Mine Management Diagram. Edwin Ludlow, Mines Minerals, Vol. 32, 7, p. 411, 1 fig.

The National Insurance Act, 1911, as it affects employers and workmen. F. S. Foley, 8vo., 62 pp. Sherratt & H., London.

The National Insurance Act. O. Clarke, 1911, 8vo., $8\frac{1}{4}$x$5\frac{1}{2}$ in., 490 pp., Butterworth, London.

Insurance of Mine Officials in the Ruhr District and the Insurance Law for Employes. (Die Grubenbeamtenversicherung im Ruhrkohlenbergbau und das Versicherungsgesetz fuer Angestellte.) F. Bertrams, Glückauf, 1912, 9, pp. 358-63; 10, pp. 399-404.

Miner's Pension Fund. Proposed Legislation. (Les retraites des Mineurs. Proposition de loi.) Rev. Noire, Vol. 15, 1912, 381, pp. 78-9; 383, pp. 99-100. (National pension fund for miners.)

Workmen's Liability Insurance. C. O. Bartlett, Mines Minerals, Vol. 32, 7, p. 412. (The cost, and who shall pay it—relative dangers of the different industries.)

Utilizing Unmined Coal for the Production of Gas. A. G. Betts, Journal Gas Light, Vol. 118, 2552, pp. 95-6, 5 fig. (The article contains a full description of an American patent taken out in 1909 to utilize coal seams too thin or too poor to be worth working.)

The Valuation of Mineral Properties. T. A. Donahue, Coll. Guard., Vol. 103, 2670, pp. 423-4. (The valuation of deferred production of mineral estates and a consideration of the applicable rate of interest upon which to calculate.)

II—GEOLOGY

The Klip River Coal Field. Natal, S. Afr. Engin., Vol. 17, 1., pp 1-2, 2 profiles. (A general idea of the geological structure of the coal field, principally the results of surface observations.)

III—MINING TECHNOLOGY

A Hydro-Pneumatic Rock Drilling Machine. (En hydropneumatisk Bergborrmaskin.) G. E. Gjuke. Bihanf till Jernkontorets Ann., 1912, 2 pp., 112-23, 4 fig.

IV—WORKING OF MINERALS

The Roden Coal Co's. Plant in Alabama. C. A. Tupper, Coal Age, Vol. 1, 25, pp. 800-3, 3 fig. (A carefully designed and equipped plant in which no expense has been spared to bring the working costs to a minimum.)

The Dewar, Oklahoma, Coal Field. J. A. Garcia, Coal Age, Vol. 1, 28, pp. 898-9, 2 fig. (The Dewar field is an excellent example, on a small scale, of the benefits derived from consolidating the individual operators.)

Engineering Requirements in Bituminous Coal Mining. W. E. Fohl, Proc. Engin. Soc. West Penn., Vol. 27, 9, pp. 503-54, 1 fig. (Deals with engineering difficulties in the mine—mechanical, operative and human.)

Method of Mining Coal. William Griffith, Mines Minerals, Vol. 32, 7, pp. 402-3, 6 ill. (Filling rooms by blasting floor up and roof down to occupy the worked out spaces.)

Mining Methods in Illinois. M. F. Peltier, Coal Age, Vol. 1, 23, pp. 732-5, 2 fig., 1 map. (A general description of one of the most important fields in Illinois.)

The Coal Fields of British Columbia. R. R. Hedley, Can. Min. Jl., Vol. 33, 6, pp. 207-9.

Silesian Mining Methods. B. C. Gullachsen, Coal Age, Vol. 1, 26, pp. 844-5, 7 fig. (In northern Silesia, the coal of the thick seams is developed by narrow stall workings driven in the lower benches of the bed. Final recovery is affected by retreating panel methods, the whole bed being extracted.)

V—BORING, SHAFT SINKING AND TUNNELLING

Recent Practice in Diamond Drilling and Borehole Surveying. J. J. Hoffman, Inst. Min. Metall., Bull. 91, pp. 1-11, 6 fig., 1 pl., 3 folders.

Studies and Experiments on the Freezing Method. (Studien und Versuche über das Gefrierverfahren.) W. Walbrecker, Diss. Lex., 21. Essen Ruhr, W. Girardet, 1912.

The Rogers Drop Shaft, Iron River, Mich. P. B. McDonald, Min. Sci. Press., Vol. 103, 27, pp. 831-3, 9 fig. (Surface equipment and construction of a concrete drop shaft under compressed air to a depth of 140 ft.)

Shaft Bottom at the Arenberg Mine. Mines Minerals, Vol. 32, 7, pp. 413, 1 fig.

Sheet Steel Piling for Sinking Shafts. Coll. Guard., Vol. 103, 2676, pp. 734-5, 4 fig. (The installation at Hatfield Main Colliery is described and illustrated.)

Ferro-Concrete Work at Harrington Collieries. Iron Coal Rev., Vol. 84, 2302, pp. 572-3, 8 fig. (The work includes the creepers at the pit bottom, the cage framing, cages, headgear, slack conveyor, banking house and gantries.)

VI—BLASTING, EXPLOSIVES

Recent Developments in Explosives. A. E. Anderson, Eng. Min. Jl., Vol. 93, 5, pp. 270-3. (The recent development of mining explosives made from nitroglycerine, with or without nitrate of ammonia.)

Electricity in Connection with Explosives. K. Scott, Iron Coal Trades Review, Vol. 84, 2291, pp. 132-4. (Ammonium nitrate the basis of the safety explosives; nitrogen from the atmosphere, the cyandiamide as a reducer of temperature of explosions.)

Queensland Mine Regulations for Explosives. Austral. Min. Stand., Vol. 47, 1218, pp. 2[illegible]. (The compulsory appointment of a qualified shot-firer with written credentials; detailed instructions as to shot-firing, and the handling and storing of explosives.)

VII—TIMBERING, PACKING, ETC.

Mine Timbering. R. B. Woodworth, Coal Age, Vol. 1, 25, pp. 809-11, 11 fig., 2 tab., 27, pp. 873-5, 3 fig. (The use of steel in the proper forms for certain classes of work, general methods of design, and cost of manufacture and installation.)

VIII—WINDING AND HAULAGE

Electric Haulages in Mines. W. C. Mountain, Iron Coal Trades Rev., Vol. 84, 2296, pp. 334-8, 11 fig. (An explanation of the different types of haulage used underground in collieries, given in a paper read before the N. Eng. Assoc., Min. El. Eng.)

Results of the Prussian Statistics of Winding Ropes for the Year 1910. (Ergebnisse der preussischen Statistiken der Schachtfoerderseile fuer das Jahr, 1910.) Fr. Herbst, Glückauf, 1912, 9, pp. 333-46; 10, pp. 424-7, 41 fig. (Protective effect of greasing and galvanizing. Influence of deflection. Tensile strength; results with strands of triangular section. Coefficient of safety.)

Large Winding Engines for South India. S. Afr. Min. Jl., Vol. 9, 2, pp. 727-8. (Engines to wind from a shaft 3700 ft. deep at 3000 ft. per min., an unbalanced load of 15.5 tons, developing 5,000 h.p.)

The Walker Overwinding-Prevention Gear. J. Paul, Trans. Min. Inst. Scot., Vol. 34, 2, pp. 56-60, 1 fold plate (An apparatus which first sounds an alarm bell and then automatically applies the brake, shuts off steam and centers the reversing gear, as fitted at the Mary Pit of the Lochgelly Iron & Coal Co., Ltd., on the cage winding gear.)

Prevention of Overwinding. Iron Coal Trades Rev., Vol. 84, 2302, pp. 561-4, 8 fig. (A description of the Visor controller and some practical experiences in its working.)

IX—LIGHTING

Portable Electric Lamps for Miners. Coal Age, Vol. 1, 26, pp. 836-7, 3 fig. (Electric lamps, worn by the mine worker, and giving a reliable light continuously for more than 12 hrs., are being introduced in a number of collieries.)

Miners' Safety Lamp Electrically Lighted. J. Prestwich, Iron Coal Trades Rev., Vol. 84, 2296, pp. 351, 3 fig.

The Safety Lamp: Its Use and Abuse. G. H. Winstanley, Min. Engin., Vol. 16, 214, pp. 32-3. (A lecture upon the scientific use of the safety lamp as an instrument for the detection of inflammable gases.)

Electrical Lighting of Mines. W. M. Thornton, Coll. Guard., Vol. 103, 2676, pp. 733-4. (The use and advantages of metallic filament lamps in mine service.)

X—VENTILATION

Overcasts with Light Walls. A. A. Steel, Mines Minerals, Vol. 32, 9, pp. 515-6, 2 fig., 1 tab.

Measuring Low Pressure Air. G. S. Weymouth, Min. Sci. Press., Vol. 104, 16, pp. 562-3, 2 fig. 1 tab. (A method for measuring small quantities of air at low pressure by means of a simple apparatus suitable for actual working conditions.)

XI—MINE GASES, TESTING

Testing for Firedamp and Blackdamp by Means of a Safety Lamp. H. Briggs, Trans. Inst. Min. Engin., Vol. 43, 1, pp. 64-79, 4 fig.

A Carbonic Oxide Detector. (Detektor na kyslicnik uhelnaty.) R. Nowicki, Hor. a hut. list, Vol. 12, 11, p. 161, 1 ill. (A small pocket apparatus with which the presence of carbon monoxide in the air down to 0.1 per cent may be detected, by means of a palladium chloride paper.)

XII—COAL DUST

Some phases of the Coal-Dust Question. W. Galloway, Proc. S. Wales Inst. Eng., Vol. 28, 1, pp. 6-35, 2 fig., 2 plates. (Early experiments and recent continental and American developments.)

Reduction, Control and Collection of Coal Dust in Mines. S. Mavor, Trans. Inst. Min. Eng., Vol. 42-3, pp. 496-556, 2 fig., 2 tab.

The prevention of Coal Dust Explosions. J. Hargar, Iron Coal Trades Rev., Vol. 84, 2296, pp. 332-3. (A discussion of the subject before the Manchester Geol. Min. Soc. mainly as to the advisability of reducing the oxygen in the ventilating air supply.)

Notes on Some Coal Dust Explosion Problems. J. Ashworth, S. Wales Inst. Eng., Vol. 27, 7, pp. 720-32, 1 fig., 4 plates. (Neither a stone-dust nor a watered zone restrains a detonative effect under experiment; there is therefore no known means of controlling the extent of an explosion.)

XIII—EXPLOSIONS

Causes and Prevention of Coal Mine Explosions. E. K. Judd, School Mines Qrtly., Vol. 33, 1, pp. 65-71. (A discussion of the most satisfactory method of robbing coal dust of its dangers.)

Bignall Hill Colliery Explosion. R. A. S. Redmayne, Coll. Guard., Vol. 103, 2679, pp. 881-4, 3 fig. (A report on the gob fire at Bignall Hill presented to the Home Department and dealing with the whole subject of gob fires in mines.)

The Susie, Wyoming, Explosion. C. S. Beach, Coal Age, Vol. 1, 28, pp. 908-9, 1 fig. (The article treats of the cause and effect of the explosion and ascribes the accident to the carelessness of some of the miners.)

Lessons from Recent Mine Disasters. J. A. Holmes, Mines Minerals, Vol. 32, 9, pp. 524-6. (A criticism of the destructive economic conditions which lead to loss of life and waste of resources in the United States.)

Cross Mountain Mine Explosion. Mines Minerals, Vol. 32, 7, pp. 393-7, 1 fig., 4 ill. (The mine, its ventilation plan, the effects of the explosion, and the recovery work.)

XIV—MINE FIRES

The Giroux Mine Fire. H. H. Sanderson, Mines Minerals, Vol. 32, 7, pp. 435-6, 1 fig (Facts in regard to its occurrence and the methods of recovering after the fire.)

Gob fires in the South Yorkshire Coal Fields. W. H. Pickering, Min. Eng., Vol. 15, 212, pp. 303-4. (Their causes and remedies: methods of working the seams, gob fires most usual at the edge of shaft pillars, or where wall or timber is left in the goaf.)

Air Mattresses for Confining Mine Fires. C Scholz, Comp.-Air. Mag., Vol. 17, 4, pp. 6495-6, 1 fig (A pneumatic curtain is described which is used in the Consolidated Indian coal mines, U. S. A. In some gaseous mines, square air mattresses, blown up by hand air pump, are utilized to make a first stopping of the air circulation; the fans then being reversed the smoke drawn back into the fire which is thereby quenched.)

XV—RESCUE AND AMBULANCE

Accidents in Anthracite Coal Mines F L. Hoffman, Coal Age, Vol. 1, 29, pp. 940-2, 6 tab. (Tables are given showing the number of persons killed and injured and the nature of the accidents occurring in each inspection district of the Pennsylvania anthracite region from 1906-10.)

A Motor Car for Mine Rescue Work. F. C. Perkins, Mines Minerals, Vol 32, 9, p. 517, 1 fig.

XVI—DRAINAGE, PUMPING, ETC.

Mine Drainage. (Bergmaennische Wasserwirtschaft.) Kegel, 8vo, 9, 211 pp., 205 ill. Halle, W. Knapp, 1912.

Unwatering Tresavean Mine, Cornwall. C. Barckenbury, Mines Minerals, Vol. 32, 9, pp. 566-70, 4 fig. (The unwatering, after 150 years' abandonment, has been successfully accomplished by means of electric high-lift turbine pumps, down to below the 248 fathom level beneath adit.)

Water Purification for Collieries. Coal Age, Vol. 1, 25, pp. 804-6, 6 fig. (The article treats of water purifying processes and apparatus, necessitated by the increasing demand for colliery bathing facilities and larger central station power plants.)

XVII—PREPARATION

Coal Washing at Lahousoge. D. A. Willey, Mines Minerals, Vol. 32, 7, pp. 391-2, 1 ill.

XVIII—COKE OVENS

Device for Extinguishing, Drying and Storing Coke. (Dispositif pour l'extinction, le séchage, et l'emmagasinage du coke de la Société d'Eclairage, Chauffage et Force Motrice.) Rev. Noire., Vol. 15, 1912, 383, p. 102, 2 fig.

Coke Oven Tars of the United States. P. Hubbard, Chem. Engin., Vol. 15, 3, pp. 92-6, 3 tab. (An analytical study of the properties of coke oven tars of the United States; a list of analysis is given of the crude tar production of 26 manufacturers.)

The Jamison Coke Plants, Greensburg. R. D. Hall, Coal Age, Vol. 1, 29, pp. 936-9, 6 fig., 1 tab. (The plants described make only 72 and 96 hour coke. The ovens supply waste gas to two boiler plants. The coke made is superior to the ordinary beehive coke, being free from black butts and a trifle lower in sulphur.)

Extensive Use of Coke Oven Gas. C. A. Tupper, Coal Age, Vol. 1, 26, pp. 832-5, 5 fig. (The article is intended to give some idea of the extent to which coke oven gas is used in combustion engines for the generation of power, and the great number of plants so operated in Europe.)

Byproduct Coke Ovens in America. F. E. Lucas, Mines Minerals, Vol. 32, 9, pp. 530-1.

XIX—FUEL TESTING

Mount Mulligan Coal Deposits, Queensland, for Coke Making and Coal Supplies. C. F. V. Jackson, Austral. Min. Stand., Vol. 47, 1211, pp. 76-7. (The coke tests were carried out in a small beehive oven and the boiler tests in a water tube boiler.)

Experiments on the Conservation of Coal by Storing under Water. (Liegen Erfahrungen oder Versuchsergebnisse über Konservierung von Kohlen under Wasser vor.) Z. Dampfkessel-Betr., 1912, 5, pp. 49-53, 3 fig., 1 tab. (By storing in the open air for 12 months there resulted a small reduction of heating value. By storing under water there is no loss of heating value, nor is there any change in the quality of coal.)

Fuels, their Testing and Combustion. (Unsere Brennmaterialien, ihre Untersuchung und ihre Verbrennung.) H. Leefelder. 8vo., 3, 81 pp., 9 ill. (Techn. Volksbuecherei, Vol. 6), Berlin, Maritima, 1912.

Spontaneous Combustion of Coal. G. C. Porter and F. R. Ovitz, Gas World, Vol. 56, 1435, pp. 12-3. (Recommendations as to the storage of coal; submergence storage is an absolute preventive but entails firing wet coal.)

The Carbon Dioxide Recorder as a Factor in Fuel Economy. E. A. Uehling, Jl. Ind. Engin. Chem., Vol. 4, 2 pp., 123-4, 4 fig.

The Microscopical Examination of Coal. J. Lomax, Coll. Guard., Vol 103, 2677, pp 787-8. (A reply to the points raised in the discussion of a paper read upon this subject.)

Calculation of Heat Value of Coal. O. L. Kowalke, Power, Vol. 35, 16, pp. 558-9, 2 fig. (A simple formula and chart are given for figuring the heat value from the proximate analysis.)

XX—STEAM ENGINES AND BOILERS

Locomotive Boilers at Collieries Coll Guard., Vol. 103, 2676, pp 731-2, 6 fig (An explanation is offered of how some of the more common defects occur and means by which danger may be averted.)

XXI—ELECTRICITY

The New Rules on Installation and Use of Electricity in Mines. Coll Guard., Vol 103, 2670, pp. 431-2.

Mining Electrical Rules. W. C. Mountain, Iron Coal Trades Rev., Vol 84, 2289, pp. 60-1 (The concentric system, leakage indication, efficient insulation.)

Electric Power in Southeast Kent. El. Rev., Vol. 70, 1786, pp. 261-6, 14 fig (The Tilmanston power house and colliery equipment at the adjacent mines.)

Central Station Generation of Power at the Central Indiana Coal Fields. J. V. Hunter, Proc. Am. Inst. El. Eng., Vol. 31, 3, pp. 277-82, 2 tab. (A discussion as to whether the conclusions derived from Indiana are applicable to Pennsylvania and other coal fields.)

Central Station Power in Coal Mines. W. H. Thomas, Proc. Am. Inst. El. Eng., Vol. 31, 3, pp. 245-58, 5 fig. (Discusses the advancing usefulness of electric power in mines with especial reference to the use of straight alternating current hoist motors up to 500 hp. capacity.)

Central Station for Colliery Service. E. B. Wagner, Coal Age., Vol. 1, 26, pp. 838-9, 5 fig. (The equipment of a small central station is described.)

Power Generation and Distribution in the Pit "von der Heydt." (Krafterzeugung u. Verteilung auf dem Steinkohlenbergwerk "von der Heydt.") El Kraftbetr., 1912, 8, pp. 153-6, 2 ill. (Data of the gas-engine power plant, the electric switch gear and distribution.)

Remote Control of Electrical Apparatus in Mines. Iron-Coal Trades Rev., Vol. 84, 2302, pp. 566-7, 2 fig.

Motor Starters for Mining Work. A. P. Drake, Iron Coal Trades Rev., Vol. 84, 2302, pp. 572-4, 2394, pp. 638-40, 2 fig. (A discussion upon the selection of suitable starting switches.)

Fault Location on Mining Cables. G. B. Burrows, Iron Coal Trades Rev., Vol. 84, 2305, pp. 695-6, 9 fig.

XXII—SURFACE TRANSPORTATION

Peckfield Colliery Iron Coal Trades Rev., Vol. 84, 2296, pp 321-2, 1 fig. (A new installation of surface plant and relayout of sidings; the screens are designed to deal with 3000 tons per 10-hr. day.)

The Consolidated Fuel Co., Utah. B. Shubart, Coal Age, Vol. 1, 29, pp. 944-5, 3 fig. (The article describes a characteristic mountain coal operation with some of the difficulties encountered.)

Coal Bunkers of Reinforced Concrete. (Kohlenbunker aus Eisenbeton.) Kupfer, Kohle Erz, 1912, 10, pp. 223-6. (Advantages of reinforced concrete bunkers.)

Double Tipple for Colonial Coal Co. W. T. Griffith, Coal Age, Vol. 1, 28, pp. 906-7, 3 fig. (The construction of a double tipple to meet special conditions at Prestonsburg, Ky. The tipple and the local power plant are described.)

XXIII—SANITATION, DISEASES

Miner's Phthisis. Min. Jl., Vol. 96, 3991, pp. 159-62. (A complaint mainly due to modern conditions of operating; the neglect of preventive regulations; state and private control should co-operate.)

Miners Nystagmus. J. Court, Optician, Vol. 43, p. 1099, p. 87-8. (Conclusions from researches conducted over a number of coal fields and extended to metalliferous mines, on the connection between nystagmus and the bad light given by ordinary safety lamps and individual predisposition.)

Housing of Scottish Miners. Coal Age, Vol. 1, 28, pp. 921-2, 3 fig. (The average miner's house in Scotland is more substantial and better equipped than in the United States. It supplies, however, quarters too narrow to suit the average American working-man and the ventilation is inadequate.)

Disinfecting Miners' Dwellings. W. H. Ross and R. C. Benner, Min. Sci. Press., Vol. 103, 27, pp. 829-30. (The principal germ-destroying agents and methods of use.)

Miners' Baths. H. F. Bulman and W. B. Wilson, Trans. Inst. Min. Engin., Vol. 43, 1, pp. 92-110, 19 fig. (Data on the question gathered from Westphalia, Belgium, and the North of France.)

Miners' Baths and Bath Houses. G. B. Walker, Engineering Mag., Vol. 42, 3, pp. 371-85, ill. (Recent British and continental practice illustrated.)

Throwing The Searchlight On Advertising

Little Talks on a Big Subject for Coal Age Readers

By the Ad. Editor

The other day a man came into our office and wanted to put an advertisement in the paper. He had a device for coal mines and wanted to introduce it to you readers through these columns.

* * *

In the course of the conversation we asked him if his product had been tested and *proved*.

He replied that the tests were in progress but that the results were not yet certain.

What did we do?

Simply told him not to risk his money in *advertising* the article until he *knew* and could *prove* that it would do the work he expected it to—

And, on thinking it over, he thanked us and went away. He'll come in again one of these days (if his tests come out right) and when he starts advertising he'll be *investing* money instead of *risking* it.

* * *

Now what does that little experience mean to you?

Simply that *we* knew that this man was starting wrong —that it would be utter folly to *advertise* an article before he was *sure* it had merit.

Because there isn't a chance on earth for a man to make money advertising a product that won't make good every claim the ad makes.

Not long ago a large concern lost several hundred thousand dollars advertising a liniment that proved to have undesirable features—

And another well-known concern lost many thousands by advertising, at a low cost, a machine that buyers found wouldn't last.

They redeemed every machine at the price paid for it—and were out all the thousands they had spent on advertising. Besides their reputation suffered more than money could repay.

The point is, advertising *must* be backed up by merit in the article advertised or the advertiser loses—loses heavily and loses alone.

Or, from *your* viewpoint, *if* an article is continuously advertised in your paper you can bet your last dollar that that article has all the merit and value claimed for it—

And such an article is worth your serious consideration and investigation.

* * *

What is it that has made the names "Tiffany" on jewelry, "Victor" on phonographs and "Elgin" on watches valuable?

Just advertising backed up by guaranteed, unfailing merit and quality in the goods so marked.

Isn't it pretty clear that, in advertising, "honesty is the *only* policy"—

And that buying advertised goods is the *safe* policy for you?